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VIEWS, NEWS AND INTERVIEWS

With the aid of electricity, constant evidences are being given of new departures and radical changes in old orders of things. The latest example is afforded by a church in Brooklyn, N. Y., "the City of Churches." An electric sign to attract church-goers has been placed in front of the edifice. It resembles the signs frequently seen on theatres, and, of course, is meant as an advertisement. Churches have advertised in the daily newspapers and other publications for many years, but this is believed to be the first instance in which an electric sign has been used to attract attendants.

A press telegram from Sloatsburg, N. Y., describes the painful alternative to which David Hemion, a telegraph operator in a block signal tower on the Erie Railroad, was recently subjected. The tower is in a lonely place, and the operator, who had come down to the foot of the stairs, found when he turned to go back to his duties that a gust of wind had blown the door shut and that his keys were upstairs. The door was too heavy to break, and knowing the vital importance of attending his signals closely, the only choice left him was to climb a high picket fence surrounding the base of the tower and jump through the glazed sash of one of the windows. He was badly injured, but managed to telegraph his condition to the dispatcher of his section who sent a physician and relief operator to his rescue at once. This is only a specimen instance of the loyalty of a class of men whose devotion to duty is far too little recognized by the public generally.

An electrically-operated whipping device is, according to a French electrical paper, being introduced experimentally into some of the penitentiaries of France. The apparatus consists of a wheel driven by an electric motor. The speed of the latter may be regulated, according to the severity of the punishment to be administered. Attached to a spoke of the wheel is a whip which swings around the circle, the culprit being placed at such an angle with reference to the instrument of flagellation that every time it comes around it strikes him squarely on the back. It is claimed for the new invention that it dispenses punishment impartially and equally. It has no animus against the prisoner; its blows are given with equal intensity, and it better fulfils the idea of even-handed justice than manual flogging, which is likely to distribute penalties very unevenly.

It is exactly twenty years ago this month that Edison gave the first public exhibition of his incandescent lamp in his laboratory at Menlo Park. He had experimented with it for two years, and while a few friends had watched its growth to perfection, the public were not taken into his confidence until just before Christmas in 1879. In the succeeding Winter he demonstrated the practicability of his discovery by lighting his laboratory and the houses of his workmen, this being the first system of electric lighting ever established. At the end of the same Winter he opened a lamp factory at Menlo Park, but soon after had to move it to Harrison, N. J., where it has increased in size until at present it is turning out something like 45,000 lamps a day.

George E. Murray, inspector of combustibles in the New York City Fire Department, has made the suggestion that automobiles driven by petroleum fuels violate the law touching the storage and use of some of those products. He thinks the law should be amended so that this class of vehicles would come within the limits.

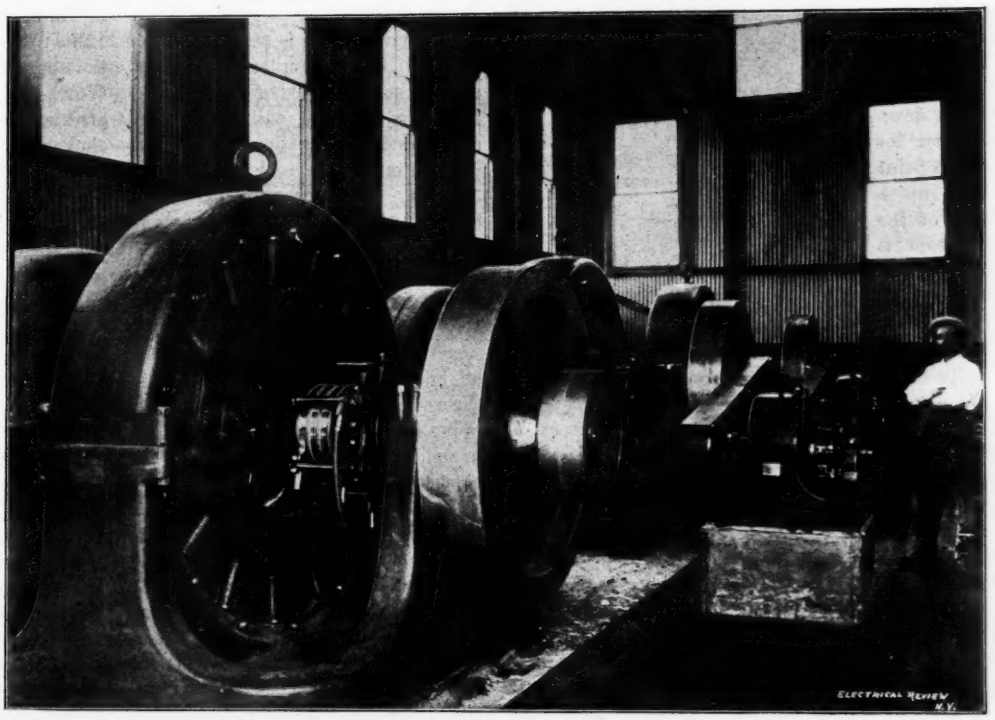

FIG. 1.—MOUNT WHITNEY POWER COMPANY'S DYNAMO ROOM.

THE MOUNT WHITNEY POWER COMPANY.

A LONG-DISTANCE HIGH-TENSION POWER TRANSMISSION SYSTEM.

The history of Berosus, the great Chaldean, is mentioned by Herodotus as covering a period of 300,000 years of the world's history. Civilizations rise and fall, dependent upon man's knowledge and power to control nature's forces. Both history and tradition relate that the tropical regions were the scenes of ancient civilization, which there is good reason to suppose reached a higher point than that which characterizes the world to-day, due to the deeper knowledge then possessed by mankind of the forces of nature. Remnants of vast irrigation works are found throughout the equatorial regions in Persia, Africa, Central America and in the Orient. Since their decay these districts have become arid deserts, for the secret of economic irrigation has been lost.

Electricity is the great magician of the present day. Long lost to mankind, its powers, now being rediscovered, are being utilized for man's benefit. The Mt. Whitney Power Company has erected its works among picturesque and romantic surroundings, to carry electrical current into the home of man, into his workshops, and to convey the blessings of irrigation over his fields. The San Joaquin Valley, Tulare County, Cal., is rich and fertile, abundantly blessed by nature, but the farming industries suffer periodically from the uncertainty of the rainfall.

Mr. W. H. Hammond conceived the idea of introducing electrical power to provide a continuous supply of water, by which the San Joaquin

Valley might be made fruitful at all times, as, by the aid of electricity, whole districts can be endowed with new life. He interested his brother, Mr. J. Hays Hammond, a well-known London financier, who secured English capital for the enterprise. Plans and specifications were prepared, and the contract to supply the electrical equipment was awarded to the Westinghouse Electric and Manufacturing Company. The general scheme consists of a water-power plant driving alternating-current generators, the current being transformed to a high voltage and transmitted to various substations 30 to 40 miles distant, where the voltage is lowered and the current distributed, principally for the purpose of driving water-pumping apparatus.

The river from which the water-power is obtained is known as the South Fork of the River Kaweah formed by the junction of a number of streams from the mountains. The river winds its way throughout the Mineral King valley, and then down the cañon and over precipices for several miles, until it reaches a point where the water is diverted into a flume. The average altitude of the country drained by this stream is about 7,000 feet above sea level, and it holds snow very late in the season, while many of the higher cañons have perpetual snow. From careful observations over many years the minimum fall of water was found to be about 25 cubic feet per second. Towering over the San Joaquin valley are several lofty peaks of the Sierra Nevadas; among them being Mt. Whitney, which rears its head 14,552 feet above the level of the sea. From this mountain the company adopted its title.

At Oak Flat, upon the Kaweah River, at a distance of 45 miles east of Visalia, and at an elevation of 2,400 feet above the sea level, a huge boulder of granite stands out, forming a natural dam 12 feet in height, over which the water leaps. A tunnel has been made through this rock, into which a portion of the water is diverted. The water passes through the tunnel which is 3 feet wide, 6 feet high and 47 feet long, and then enters the flume. About 14 feet from the entrance to the tunnel, which swerves so as to bring it nearly the parallel with the river below the falls, a substantial framework of heavy red-wood timber has been fitted and cemented to the first box of the flume. One hundred feet from the tunnel a system of waste and regulating gates causes the desired quantity to pass into the flume.

The water is conveyed for six miles to the Mt. Whitney power house. The flume is a very interesting piece of engineering construction, being built over a rough mountainous country. For 30,000 feet it meanders along the steep mountain side, over granite boulders and smooth bluffs. The river is gradually left below, as the grade of the flume is much less than that of the river, being one foot in 200, or 26.4 feet per mile. The flume is 3 feet wide and 2 feet deep, constructed of red-wood boards, 1½ inches thick and 12 inches wide,

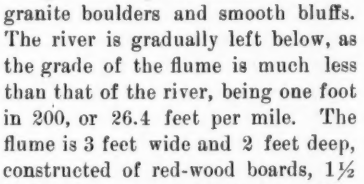

FIG. 2.—MT. WHITNEY POWER CO. THE OUTLET JET—17,000 FEET A MINUTE.

resting on 4 by 4-inch sills, spaced 4 feet apart, and is enclosed by posts and caps of 2 by 4 inches set at each sill. In many places trestles carry the flume over ravines and other rocky places. The carrying capacity of the flume is greatly in excess of present needs, provision having been made for the operation of additional machinery when the demand for electrical current exceeds the output of the present installation.

The flume terminates in a sand-box and overflow gate, an apron at right-angles leading off to the penstock. This apron is 9 feet wide, and its entrance is equipped with gates which regulate the amount of water which may flow into the pipe. The apron delivers the water into the penstock, which is 6 feet by 8 feet, and 16 feet deep. From the penstock a pipe line carries the water in a straight line to the power house, a distance of 3,300 feet, the height perpendiculary being 1,300 feet. The pipe line is laid over ridges and very rough places, securely buried in a deep trench for the greater part of the way, particularly for the lower 2,000 feet. At the penstock end the pipe is 50 inches in diameter, tapering down to 24 inches in the first 50 feet, the lower part of the line being reduced to 20 inches. The pipe was hoisted into place by means of an overhead cable stretched from the bottom of the hill to the top, being carried on trolleys suspended from the cable, and moved by a draw line and hoisting engine. Some of the pipes are laid at an angle of about 45 degrees, and many of them at angles of from 25 to 30 degrees.

At the lower end of the pipe line, at the corner of the power house, are three heavy steel castings 10 feet apart, each having an outlet to the power house for conveying water to the wheels. There is a fourth outlet at the extreme end of the pipe, which serves as a waste way, equipped with a gate and nozzle. The pressure registered at the nozzle in the power house is 565 pounds to the square inch, which causes water to issue from the nozzle at a velocity of 17,000 feet per minute. A view of this outlet is shown in Fig. 2.

The power house is near the base of Red Hill, about 35 miles from Visalia, a plain, substantial structure of Oregon pine, covered with galvanized corrugated iron, resting on concrete foundations. The building is 30 by 50 feet. A hand-power traveling crane of eight tons capacity serves to handle heavy loads. The water wheels are solid steel castings 50 inches in diameter, weighing about 1,400 pounds. The nozzle of each wheel is equipped with a special cut-off hood, operated from a stand at the switchboard, so that the amount of water supplied to the wheels is under the immediate control of the operator.

The electrical equipment consists of three 450-kilowatt, three-phase generators, giving current of 440 volts and 60 cycles per second at 515 revolutions per minute. The generators are direct-coupled to the water-wheels, which are mounted on one end of the extended shaft, and a fly-wheel weighing 4,000 pounds upon the other. There is also attached to the shaft a driving pulley for the exciter. A view of the interior of the power house is shown in Fig. 1. The three generators have a normal capacity of 1,800 horse-power. Two exciters, 15 kilowatts each, having a speed of 1,050 revolutions per minute, deliver direct current at 125 volts. Each exciter has sufficient capacity for the three generators, and is so placed in the power house that it can be driven from any of the generators.

The opposite end of the power house is equipped with the switchboard and raising transformers. The switchboard has five panels, consisting of an exciter panel, three-generator panels and a feeder panel, and is equipped with the usual indicating and controlling apparatus. From the generators and exciters the cables and wires pass under the floor in conduits to the switchboard and thence to the raising transformers.

The four transformers, of 500 kilowatts each, are of the oil insulated, self-cooling type. They are arranged for stepping up from 440 volts to 20,000 or 34,000 volts, depending whether their secondaries are connected on the delta or star system. The secondary wires lead from the top of the transformers on brackets to an addition on the westerly side of the power house, where the high-tension switchboards are arranged, by means of which the current is delivered to the transmission lines. The high-tension current passes to the lightning-arrester house, a building 12 feet square, about 25 feet west of the power house, containing three Wurts non-arcing metal lightning-arrester units, each consisting of six choke-coils in series with the line, and 30 arresters mounted on a marble slab.

From this point the current is delivered to the transmission line, consisting of three No. 2 Brown & Sharpe gauge copper wires.

About 21 miles from the power house the transmission lines are branched off, one line going south through Exeter and Lindsay to Porterville, the other going westerly to Visalia and thence to Tulare. The distance from the power house to Porterville is about 43 miles; to Visalia about 29 miles, and to Tulare about 40 miles.

Substations for distribution of current are situated at Visalia, Tulare, Exeter, Lindsay and Porterville, where the three-phase, high-tension current is received and transformed to two-phase current at 2,000 volts. The Visalia substation, in addition to the transformers and lightning arresters, contains a switchboard, a rear view of which is shown in Fig. 3, and a 30-light arc machine for street lighting, driven by a 20-horse-power Westinghouse type "C" motor. The incandescent lighting circuits are supplied from the 2,000-volt line by being direct-connected to the secondaries of pole transformers, which reduce from 2,000 to 104 volts.

At Lindsay three 3-wire, two-phase power and lighting circuits have been carried to large orchards 1½ miles distant, where a 15-horse-power induction motor operates cen-

trifugal pumps for irrigation purposes. From all the substations light and power circuits are run to any point where current is required, and it is anticipated that the demand for current will soon equal the present capacity of the generating plant. At all the points to which current is distributed induction motors are in operation for driving pumps, operating printing offices, ice plants, elevators in hotels and for general industries.

Although the plant has but recently commenced operations 8,000 acres are already being irrigated through the agency of the power by means of Westinghouse motors.

The price charged for electric light and power are such as bring it within the reach of all. The price for one horse-power per annum has been fixed by the company at $50.

It has been found more economical for a number of the smaller farmers to unite in putting in a pumping plant operated by a motor. The big stream of water thus obtained is sufficient to irrigate fields covering a considerable district.

The principal advantage that electricity has over other powers is that polyphase alternating-current motors run practically without attention. This motor is as simple to run as a wheelbarrow, and it does not require a skilled attendant.

It would be impossible at this time to make an intelligent prophecy of the benefits that will result from the completion of the Mount Whitney Power Company's enterprise. To the city it means cheap power for manufacturing purposes, and cheap incandescent lights; to the farmer it is an absolute guarantee against drought for all who have the energy to sink wells and employ power to pump water. In the San Joaquin valley crop failures are unknown when there is a good rainfall or where there is good irrigation.

A Big Electric Power Installation.

A press dispatch states that an enormous electric-power plant, capable of furnishing power for the whole establishment, is to be put in place at Armour & Company's packing house in Chicago, soon after January 1. The cost of the equipment, it is stated, will be over $1,000,000. The substitution of electricity for steam it is thought will save money in the long run so appreciably that the $1,000,000 will come back to the company in a few years.

Velvril—A New Rubber Substitute.

In a recent paper before the London section of the Society of Chemical Industry, Mr. Walter F. Reid described a new rubber substitute which is called "Velvril."

Alluding to the possibility of the demand for rubber exceeding the supply of the natural product, Mr. Reid stated that the consumption is now estimated to be 60,000 tons per annum. The exports from Para show the greatest increase, the total shipped from this port in 1898 having been 25,000 tons, an advance of 3,000 tons upon the total for 1897. The Singapore variety of natural rubber (by which the author seems to mean gutta-percha) shows, however, no such advance, and in 1898 the exports from this port only amounted to 2,600 tons. As this is the material most suitable for cable insulation, and as the last cable laid to New York required over 500 tons, or one-fifth the annual output for insulation, the situation of the cable manufacturer with regard to the supply of natural rubber is seen to be somewhat anomalous.

The new substitute for rubber is a mixture of nitrated linseed oil, or castor oil, with nitro-cellulose. The nitrated oil is prepared first, and is then mixed with the nitro-cellulose. A homogeneous mass is obtained, the elastic and other properties of which can be greatly varied by alterations in the proportions of the two constituents. The proportions which yield a product most closely resembling Para rubber are two pints nitrated oil and one pint nitro-cellulose. Castor oil yields better results than linseed oil. The elasticity of the product is twenty-five per cent. Its durability is greater than that of rubber, a sample of the product, after three years' exposure to all the vicissitudes of the English climate in the author's garden, having shown but slight marks of deterioration. The product can be moulded under heat and pressure, or it can be worked by dissolving in any suitable solvent and then evaporating the solvent. When used for coating cables, the artificial product may either be applied in the form of a thick paste, the solvent being allowed to evaporate after each coating, or the solid product may be applied directly with the aid of heat and a pressure of fifteen tons per square inch. The author considers that the latter method gives the best results.

Velvril may also be applied as a tape-wrapping of thin sheet, in the same manner that rubber is applied in the present method of cable manufacture.

Velvril is superior to vulcanized rubber, in that it is without action on copper. The author showed samples of copper wire coated in the manner described—with velvril—but he did not give any insulation tests of the new material, and, in response to inquiries, stated that further experiments upon this use of velvril were in progress. The greater portion of his paper was devoted to the other applications of velvril, a mere enumeration

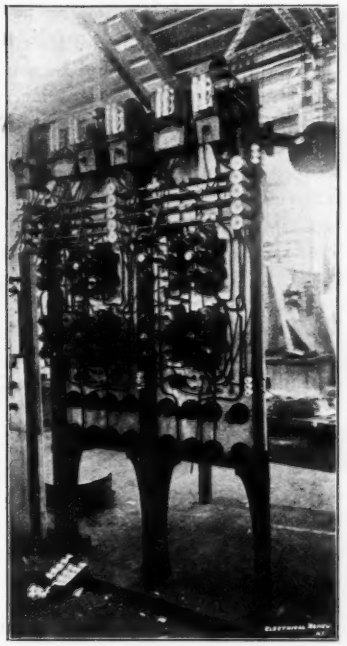

FIG. 3.—MT. WHITNEY POWER CO. SWITCHBOARD IN VISALIA SUBSTATION.

of these showing the wide possibilities of the new substitute for rubber, if the price at which these manufactures can be sold will permit them to enter into keen competition with those produced from other materials by the older method of manufacture. As Mr. Reid studiously avoided the subject of cost in his paper, one may be excused for remaining somewhat skeptical on this point until further information is forthcoming.

In the discussion which followed the reading of the paper, considerable attention was directed to the question of the explosiveness of the artificial material, and of its readiness to become ignited, but Mr Reid assured the inquirers that velvril was non-explosive, and not more inflammable than other organic products.

An order for 41 locomotives for the Southern Railway, recently placed with a locomotive works in Richmond, Va., specifies that all the engines shall have electric headlights.

Electrical Developments in Mexico.

Information concerning one of the largest financial organizations that has been established recently in Mexico to develop electrical and mechanical undertakings in that country, as mentioned in this column a few weeks ago, is given in the Mexican journal, *Las Dos Republicas*, as follows: "The organization of one of the most important companies ever placed on a business footing in the republic has been completed. The company is to be known as 'La Compania Mexicana de Fuerza Motriz,' and it has a capital stock fully paid in of $10,000,000, Mexican currency, subscribed in London, New York, Philadelphia and Mexico. One of the most encouraging features of the new organization is the large amount of Mexican capital interested in it, as it is a well-known fact that Mexican capital is extremely cautious. The company has acquired rights for using the waterfalls throughout eight of the richest states in the republic. The most important are the falls of the Rio Blanco, in the State of Vera Cruz, which will be developed first and on which work will be commenced at once. Over 7,500 horse-power have already been contracted for by manufacturers from the United States and Canada, who will establish plants near the falls. In all the company has at its disposal something like 150,000 horse-power. The object of the company is to establish foreign factories throughout the republic and furnish power at a minimum cost to local industries. The company enjoys liberal concessions from the government.

The Triumphant Electromobile.

The New York City Park Commissioners have issued a permit to W. E. Buzby, of 111 Broadway, to drive an automobile into the Park. Mr. Buzby is the lawyer who brought about his own arrest last October while entering Central Park in an automobile, so as to test in court the right of the Park Commissioner to exclude such carriages from the Park. He was discharged in the Yorkville police court, as there was then no park ordinance prohibiting such vehicles from entering the Park. The Park Board passed such a regulation a few days afterward. The form of the new permit which was given to Mr. Buzby was as follows:

To enter up n and pass over the drives of Central Park with an open electric carriage (phaeton) operated by an experienced motorman. Revokable at any time and subject to the rules and regulations of the Department. In accepting this permit the holder agrees to exercise the greatest possible care to avoid frightening horses on the drives or bridle paths, or causing any danger or annoyance to the other frequenters of the Park.

SCIENCE BREVITIES.

The Magnetization of Long Iron Bars—Dr. C. G. Lamb, in the *Philosophical Magazine*, gives some interesting experimental results concerning the distribution of magnetic induction along a long cylindrical iron rod. When the rod is weakly magnetized, the mean positions of its poles are comparatively near the ends of the rod; with stronger magnetization the poles move farther from the ends; and with very strong magnetization the poles move more and more towards the ends. This result, as Dr. Lamb points out, has important bearing upon the magnetic testing of iron by Ewing's method.

Liquid Sulphur Dioxide—The only ionizing inorganic solvents hitherto found in addition to water are nitric acid and liquefied ammonia. In a recent number of the *Berichte*, Professor Walden, of Riga, gives a preliminary account of experiments with liquid sulphur dioxide, which shows that this liquid acts to an unsuspected degree as a solvent for inorganic and organic substances. Since it permits of double decompositions, and gives electrolyzable solutions, liquid sulphur dioxide must now be reckoned as an ionizing solvent. Many substances dissolve in liquid sulphur dioxide with characteristic colors. Thus the iodides of the alkalis and alkylammoniums dissolve with a yellow color. As an example of double decomposition, the action of potassium iodide on trimethylammonium chloride may be cited. These substances in sulphur dioxide solution give a precipitate of potassium chloride. Ferric chloride and ammonium sulphocyanide give the usual red color of ferric sulphocyanide. The electrical conductivity of salts in sulphur dioxide solution is not the same in order as that in aqueous solution, nor does the molecular elevation of the boiling point in liquid sulphur dioxide correspond altogether with that found in aqueous solutions. Professor Walden promises a thorough investigation of the many points of interest raised by this new discovery.

Kerr's Phenomenon—In the *Bulletin* of the French Physical Society, No. 137, is described an ingenious disposition for estimating the duration of Kerr's phenomenon, in which certain dielectric liquids are made to assume the optical properties of double refracting crystals by placing them between the plates of a condenser. The light observed is produced by the spark by which the condenser is discharged, and the time interval between the discharge and the passage of the light through the condenser may be varied by an arrangement of mirrors, whereby the rays may be made to traverse any length of path required. The experimenters, MM. Abraham and Lemoine, find from these investigations that Kerr's phenomenon is reduced to half its original value in the four-hundred-millionth of a second, and becomes insensible in the one-hundred-millionth of a second after the discharge of the condenser. MM. Abraham and Lemoine have also succeeded in showing Kerr's phenomenon for a conducting liquid. The Kerr condenser, having water between its two armatures, is arranged in the circuit connecting two ordinary condensers in series. On discharging these by the spark used as the source of light, the charges liberated instantaneously charge the plates of the Kerr condenser. For a very small interval of time the water is affected in the same way as a dielectric, and, on observing the analyzer, a brilliant reappearance of light establishes the existence of the phenomenon.

Electric Ageing of Timber—M. J. A. Montpellier gives in *L'Electricien* some interesting details of the mechanical equipment of the factory at Aubervilliers for the electrical seasoning of timber. At this place the process used is that known as the Nodon-Bretonneau. In this installation every precaution has been taken to ensure that the cost of labor should be reduced to a minimum, so that the process should start with every prospect of being able to compete with older and well-established seasoning processes. The seasoning vats are placed in a line under traveling cranes, which are used to transport the timber to and from them. The length of these vats is varied, according to the size of timber to be dealt with, from 4½ yards up to 13 yards. The width of the vats varies from 5 feet up to 10 feet, while the depth is kept constant at about 5 feet 3 inches. Each vat is supported on insulators. An interesting feature in the arrangements is that the platform in the vat on which the timber rests is directly supported on the plungers of hydraulic cylinders, by which the charge of timber can be readily lifted clear of the liquor. In this way it is exceedingly easy to recharge the vat, as the timbers are simply stacked in alternating longitudinal and transverse layers. The heavy upper electrodes are then laid on the charge, lowered by the hydraulic cylinders until the electrolyte reaches the desired height round the wood. The heat required for the solution is obtained by means of steam-coils. It is also stated that once a month the organic materials which escape from the wood are removed from the bath by raising the solution to boiling point. The organic materials then rise to the top, and can be readily skimmed off. The nine vats actually put down at Aubervilliers provide for the simultaneous treatment of about 3,200 cubic feet of timber.

Velocity of Ions—Professor A. P. Chattock, in the *Philosophical Magazine*, gives the results of a very ingenious determination of the velocity of the charged air particles or ions in the electrical discharge from a metal point. He finds the velocity to be 413 centimetres per second for positive ions, and 540 centimetres per second for negative ions, both for an electic field of 300 volts per centimetre. This result is in remarkable agreement with the velocities of the air ions which are produced by X-rays and by uranium radiations. Professor Chattock also shows that the velocity of the wind which blows from a discharging point is not greater than two per cent of the velocity of the ions, and he estimates that these ions are molecular aggregates of about 8,000 ordinary molecules each. This estimate of the mass of the ions is, of course, based upon data not altogether satisfactory.

Atomic Weight of Radium—Demarçay's work on the spectrum of radium brought out the fact that as the proportion of the radio-active constituent in the barium chloride becomes greater, certain spectrum lines increase in brightness (see the ELECTRICAL REVIEW for December 13, 1899, page 374). The other conditions being equal, this gives a definite and valuable indication that the radio-active substance has a distinct existence apart from all known elements. Following up this hint Mme. Sklodowska Curie has endeavored to determine the atomic weight of radium, or at least to get some information as to its order of magnitude, says an *Electrician* abstract. For that purpose she subjected to fractional distillation a mass of purified radiant barium chloride, obtained from half a ton of uranium residues supplied by the Austrian Government. She further treated the chloride by fractional precipitation in alcohol. The highly active substance obtained was used for determining the atomic weight by means of the silver nitrate reaction. The values thus obtained varied from 140 to 145.8, as against the atomic weight of inactive barium, 137.7, found at the same time. This, of course, leaves the atomic weight of "radium" indeterminate, but it is clear that radium is not allotropic barium, since no allotropic forms of an element have different atomic weights. And further, whatever be the atomic weight of radium, it must be greater than that of barium.

Radiant Matter—Further researches on radiant matter in pitch-blende have been made by M. A. DeBierne, and are published in the *Comptes Rendus*. Polonium, already found by Curie, seems akin to bismuth and radium to barium. DeBierne has worked upon that portion of the solution of pitch-blende which is not precipitated by hydrogen sulphide in acid solution, but is by ammonia or ammonium sulphide. In this portion were present with iron and aluminum small quantities of many other metals, as zinc, manganese, chromium, vanadium, etc., and rare earths. A new radiant substance was found closely akin analytically to titanium, whose power is 5,000 times as great as that of uranium, but is not spontaneously luminous as in the case with radium.

Automobile Permits in Central Park, New York City.

Some time ago the Board of Park Commissioners, of New York city, decided to issue permits to owners of automobiles, permitting them, under most elaborate restrictions, to enter Central Park with their vehicles. So far, ten permits have been given out. A few days since the permits issued to Mr. Jefferson Seligman and to Mr. Isaac L. Rice, former president of the Electric Vehicle Company, were revoked, on the alleged ground that these gentlemen had let uniformed motormen conduct their vehicles in the park, and that this looked as if public vehicles were entering its sacred precincts. Meanwhile, any tyro who can meet the charges of a livery stable is permitted to drive horses in the park, and public horse-drawn cabs and hansoms are much in evidence on its roads. It is to be hoped that the measures the excluded gentlemen will take concerning the revocation of their privileges will determine, once and for all, who owns New York's parks.

ELECTROSTATIC ROTATION—III.

BY ALFRED G. DELL.

In the following are described some further experiments made with the rotating disk described in the ELECTRICAL REVIEW, of November 22, 1899. I have tried several other ways of rotating the disk than those described in the above mentioned article.

I will first state what improvements I have made in the pendulum arrangement. The one in use at present has the cardboard that is covered with tinfoil 1¾ inches wide and 4 inches long, with a small space at the top free from tinfoil. The edges all around the tinfoil and the top are given a coat of shellac. The cardboard, that which is covered with the tinfoil, is swung by thin silk of the same width as the cardboard, there being only about ⅛-inch between the cardboard and the place of suspension The disk has as an axis a piece of stiff brass wire, 1 inch long, pointed at both ends, running in small metallic holes at the top and bottom; the top part is intended to keep it from falling over. It has a free motion, not being bound in any way.

With this arrangement, when the disk is rotated, the pendulum swings, after the influence machine has been stopped, for 1¼ minutes. With the pendulum alone and a Geissler tube, lighted from the discharger from the outside coatings of the jars, the pendulum swings from 3 to 3½ minutes—the time appearing to depend somewhat upon the condition of the atmosphere of the room, which is, to some extent, affected by the condition of the weather outside. The pendulum does not swing slowly, like that of a clock, but when the jars are full it flies rapidly from one pole to the other, gradually slowing up as the charges are used.

The other means tried to rotate the disk were when the tinfoil on the cardboard, which is below the disk, was connected direct to the poles of the static machine and to an induction coil.

When connected direct to the poles of the influence machine the disk rotated very rapidly, but only while the machine was in operation; the Leyden jars did not become charged. As soon as the machine stopped the disk received no more repulsive force.

When connected to the terminals of an induction coil the disk rotated, but very slowly and poorly. The spark used had to be small or it would cross from one of the small brass plates to the other. I tried other ways of attaching the apparatus to the coil, such as attaching one terminal of the coil and earthing the other, but the disk would not rotate for me. I used one small plate and one larger one so I could bring the point of the larger around and let sparks pass between the points (the points in this case and all others here described were raised and slanted, which is by far the most favorable condition for a rapid and sure rotation). I obtained no rotation although the sparks passed directly along the one side of the disk close to it. The force driving the disk appears to be absent or very feeble when an induction coil is used. I also tried a Tesla coil but obtained no rotation. I attached a Geissler tube to the outside coatings of the Leyden jars, so their discharges would pass through the tube, and swung the tube above the rotating disk driven by the jar discharges of the inside coatings, and found that at every swing of the pendulum, whenever it would strike a pole of the machine and a spring connected with the tinfoil on the cardboard under the disk, a piece of paper pasted on the disk appeared in the dark to stand still in the same manner as the sectors on a static machine are seen at every spark that is made between the poles attached to the machine and jars.

Of course, the disk had to be run by the jars alone. If the machine was in operation the light in the tube did not disappear or grow dim at any time. It is remarkable that when the Geissler tube is attached to the outside coatings of the jars, and the machine is in operation, small discharges from the jars should occur; they can be seen in the Geissler tube as reversals of the discharge direction.

Mr. Chas. E. Brown, secretary of the Central Electric Company, Chicago, has been visiting New York city with his family.

Laying a Cable With a Locomotive.

The submarine cable which connects Randall's Island in the East River with the mainland at the foot of St. Ann's avenue in the Borough of the Bronx, New York city, was laid, in what was probably record time, with the assistance of a locomotive engine. The illustration shows the paying out of the cable by a gang of men, the locomotive, which is furnishing the motive power, being in the background. The cable is of a six-conductor type and is used for fire-alarm and other municipal purposes between the public institutions on Randall's Island and the mainland. Its length is about 600 feet.

LAYING A SUBMARINE CABLE WITH A LOCOMOTIVE.

On Sunday, September 17, 1899, the cable was uncoiled and laid out in a line in the direction in which it was to be pulled into the river. Across the body of water between the mainland and the island, the Bronx Kills, was stretched a one and one-quarter-inch rope which passed through a snatch block at the foot of the cable pole and came back to the locomotive, to which it was attached. The other end was made fast to the end of the cable, and when all was ready the locomotive was gently started. About the middle of the operation the engine was stopped and a new hold was taken on the cable and a new attachment made to the locomotive. This was done in order to secure sufficient slack in the cable itself to insure its safe movement over the ground. The total length of time occupied in putting it in position was eleven minutes. Mr. H. F. Blackwell, Jr., assistant in charge of the borough fire-alarm telegraphs, to whose courtesy the above information is due, says that the cable is now working excellently and tests out very well. The cable was made by the Safety Insulated Wire and Cable Company, of New York.

Joseph Henry Centennial.

At the centennial celebration by the citizens of Albany of the birth of Professor Joseph Henry, held in that city on the evening of December 16, under the auspices of the Albany Institute and the Albany Historical Art Society, President Verplanck Colvin, of the institute, read a letter from President McKinley attesting the good work done by Professor Henry in developing magnetic telegraphy. He said that not only our own country, but the world at large, owes much to Professor Henry for his scientific discoveries. In calling the meeting to order President Colvin paid a glowing tribute to Professor Henry. He said in part:

In 1831 Professor Henry developed his system of magnetic telegraphy, and within these halls (Albany Academy) placed a telegraph wire a mile in length, over which signals were sounded by the self-same magnet and bell which you will hear tonight. The telegraph was now a reality—he would not patent it. Thus here began a greater phase of his character, his unselfishness and his devotion to the public welfare. We are now brought face to face with that noble nature, which as college professor, as director and developer of Smithson's magnificent bequest to the American people, as counsellor of the United States Government in its most important scientific and technical works, as a discoverer in many branches of science, made him great among our greatest—faithful, noble and true.

Professor Sylvanus P. Thompson.

In the ELECTRICAL REVIEW'S British letter last week appeared this sentence:

"The name of Professor Silvanus Thomson must be nearly as familiar to you as it is to us."

The statement is true, but it must be confessed that it doesn't look so, when two errors in the spelling of his name are allowed to creep in. To Professor Sylvanus P. Thompson, therefore, the ELECTRICAL REVIEW owes its apologies—for his name is both well and most favorably known in its office and by a large number of its readers.

Wireless Telegraphy Across Lake Michigan.

A press dispatch from Toledo says that the first important practical test of wireless telegraphy in this country will be made by the Ann Arbor Railroad, which will endeavor to operate by it from Frankfort, Mich., to Menominee, Wis., across Lake Michigan. The road operates a car-ferry service between those places, and at present is compelled to depend upon a line through Chicago for telegraphic communication. During stormy weather it has experienced no end of delays with this line, which has greatly hindered the operation of its boats.

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CHRISTMAS.

The holidays this year come at a time of almost unparalleled activity in the electrical trades. At this season, when it is natural to rest a little from the work of the year to review the past and to make plans for the future, the retrospect is most pleasant, while the outlook is all that can be desired. It is, therefore, likely that Christmas will be merrier and the new year happier than usual.

To all its readers and friends the ELECTRICAL REVIEW wishes the fullest prosperity and greatest happiness, not only for the passing holiday time, but as well for the future which seems so bright and full of promise.

PUMPS OPERATED BY ELECTRIC RAILWAY CURRENT.

It is stated on good authority that the Chief of the Fire Department of New York city is afraid that the third-rail system about to be installed on the Manhattan Elevated Railways will be a handicap to the operation of the firemen and a menace to the lives of his men when they stand on the structure to fight fires in the neighborhood. In view of the experience that has been had in Chicago, Liverpool and other progressive communities where the electric elevated railway is an established success, this sounds ridiculous, to say the least. As a matter of fact, the electrical equipment of the elevated line will be one of the most powerful auxiliaries that the New York Fire Department possesses. Any section of the conducting system can be instantly cut out and rendered entirely innocuous, if this is desirable. It is not likely, though, that it will be found even desirable, though, of course, if the firemen occupy the structure it will be necessary to stop the movement of trains. The point that the Fire Chief overlooked, however, is that along these structures that traverse the length of Manhattan Island, and which are nowhere more than a few hundred yards from any building in it, will be distributed a system of power that can be applied simply and instantly for his own purposes. An electric motor pump of great power—far greater than that of a steam fire engine for the same weight—can be hauled to the vicinity of a fire, connected with the electricity supply system of the elevated railway and put to work in a few seconds. These railways, then, instead of being in any way a hindrance to the operations of the fire department, should become one of its most valuable adjuncts. It is to be hoped that the Chief will change his mind.

ELECTROLYTIC ALCOHOL.

In the last issue of the ELECTRICAL REVIEW appeared an interview concerning the electrolytic preparation of alcohol and its use as an automobile fuel, which contains a good deal of food for thought. The heat energy of ethyl alcohol is very high. It is almost an ideal fuel, burning without odor and without smoke and being reasonably safe to handle. If it is true that it can be made by electrolytic means for a few cents a gallon, and if the internal revenue laws of this country can be amended so as to permit its use in the arts without the payment of a prohibitive tax, this new product of electricity will become a very valuable factor, not only in automobilism, but in many directions in industry. There is hardly anything in the way of an odor more objectionable than that of half-burned gasoline. It is likely that if any attempt were made to introduce automobiles, using this fluid as fuel, in the narrow crowded streets of New York city, there would be an immediate popular campaign against them, and the Board of Health would doubtless take a hand. This objection to the explosion-motor vehicle does not hold in the case of those worked by alcohol, and, moreover, with increasing use and the more or less limited supply, the price of petroleum products must naturally rise. If alcohol can be manufactured at ten cents a gallon or less, the effect of an increased demand will be to cheapen the cost of making, rather than the reverse.

ENGINEERS AT THE PARIS EXPOSITION.

It is proposed that the American Institute of Electrical Engineers shall meet next year at the Paris Exposition. It is also proposed to hold this meeting jointly with the British Institution of Electrical Engineers, and at the time of the International Electrical Congress.

To this suggestion we would like to add another one, which, if acted upon promptly, would result in a pleasant and comparatively inexpensive arrangement for the trip to Paris. It is that the Institute invite the co-operation of its sister societies, the American Society of Mechanical Engineers, and the American Society of Civil Engineers, and that a vessel be chartered by these bodies jointly for the use of members and their families. This arrangement was carried into effect during the Exposition of 1889, when the members of the Mechanical and Civil Engineering societies chartered a vessel which took them directly to Havre, and upon which, both going and coming, they were absolutely at home and comfortable. The expenses of the trip were less to the individual members than if they had taken their chances and bought passage on the regular liners. This suggestion is one that we think deserves consideration if the Paris meeting project assumes definite shape.

Among the institutions marked as victims to progress is the Fifth avenue stage line in New York city. For years this archaic line has remained a meek but dignified monument of a half-forgotten past. Swift trolley cars have clanged their bells on the adjacent thoroughfares, but no change has affected the decorous progress of the venerable vehicles on New York's most famous avenue. Four statute miles an hour has been the speed limit; neither stages nor horses could stand a faster schedule. In the chaotic rush of progress these ancient chariots have held their own as reminders of the primitive days of our fathers. Now shiny electromobiles, with rubber tires and alarm gongs, will take their place. It is to be hoped that some museum of transportation will secure a stage with its driver and horses before it is too late, and embalm them as representatives of *fin de siècle* transit methods in America's metropolis.

A British View of Accumulators and Electric Vehicles.

The question must be very prominent in the minds of many as to whether electric accumulators are of the slightest use for the propulsion of vehicles, says our London namesake. It is true that motor cars which depend upon accumulators make an occasional brave show in the streets of London; and one following in the wake speedily realizes the difference between that and an oil car. But the prevailing notion is that accumulators are more or less experimental, and that we may have to wait some time before we obtain a really practicable electric-motor vehicle. Although we can not wholly coincide with such a view, there is, judging from recent experience, a certain amount of reason in that attitude. The performances of the London Electric Cab Company and the Electric Omnibus Company have done much harm to electrically-propelled vehicles of the self-contained type. The first-named concern was brought on to the market with a great blare of trumpets, and the public rapidly, if not eagerly, took up the venture. Electrically and commercially it was unsound, and the criticisms which were advanced at that time have been amply verified. It is quite true that an elaborate series of experiments were conducted by the engineers of the concern, and we firmly believe that a good deal of valuable information was thus obtained. But so far from the Cab Company benefiting from the experience which they obtained in this manner and, selecting the best types of cell, they seemingly took up a cell which, according to their own tests, was quite inadequate to the needs of a cab service. Presumably, the reasons that led the directors to adopt this accumulator were the somewhat handsome terms for maintenance offered by the accumulator company. Whatever the reasons may have been, it is said that the conditions of maintenance were not fulfiled, and with the absolute failure of the accumulators it was only a matter of time before the cabs were taken off the streets. An inquiry into the exact circumstances surrounding the flotation of this company would probably reveal some very disagreeable features. We do not for the moment propose to enter into such an investigation, but it should not be overlooked that this company paid for a form of gearing more or less valuable, practically £21,000, and on the top of that it entered into an agreement to pay a royalty of £4 per cab for the use of a controlling device. Without an accumulator all these patents, for which such handsome sums had been paid, were not able to be brought into practical operation. The Omnibus Company, which was formed to propel 'buses by electricity, had a protracted but inglorious existence, and it is doubtful if this concern, in the whole of its somewhat lengthy life, has left any data that can be of real value in future work. The disastrous results that have attended these schemes are likely to have very material influence upon future attempts to introduce electric cabs; and yet it would be exceedingly unfortunate, both for the public and the electrical industry, if any really sound concern were to meet with no support on account of former failures. The investing public, however, has a long memory, and it is certain that any scheme which pays heavily for patent rights, and is thus under the necessity of providing a large capital will meet with very little support. In Paris and America, particularly in the latter, a certain degree of success has attended the efforts to introduce a public service of electrically-propelled vehicles, and even within our own shores some of the most important and far-reaching results have been obtained in accumulator traction. We refer to the electric line at Birmingham, and though it is more or less an open secret that the maintenance figures obtained are most remarkable, there is, for some reason or other, a difficulty in persuading the owners of the system to publish actual results. This is particularly unfortunate, because this line is commonly credited with being the most expensive electric line in this country, or probably the world. Whatever may be the ultimate outcome of the New York electric cab service it seems that, financially and electrically, notable success has been achieved. Curiously enough, the commencement of the service in New York was almost contemporaneous with that of London. Probably the first efforts of the New York people were a little more modest than ours, for they started with 14 vehicles, and this has been gradually increased to 200 in actual operation. Later reports show that something like 2,000 vehicles are being constructed to operate in New York alone. Although one can not attach much significance to financial operations, it is certainly worth mentioning that shares which cost £20 in 1897 now stand at £97. But what is of paramount importance to all interested in electrically-operated vehicles is the fact that a dividend of 8 per cent has been paid on the preference, and a dividend of 2 per cent on the ordinary shares. Surely if it is possible for an electric cab company to be electrically and financially successful in a city like New York, which is notoriously badly paved, how much better should such a service be in London. When we consider these figures, one can not help feeling indignant that there has been so much wasted effort in this country. It is extremely probable that attempts may be made in London during the next few months to start a new electric car service, and, if that is the case, we would offer a word of advice to the promoters: "Do not suggest anything that will involve a large capital outlay, keep down the vendor's price, and be sure of a satisfactory accumulator before making a start." Unless these conditions are met, we may be sure that any new attempt to start electric vehicles will receive but scant consideration.

American Institute of Electrical Engineers' Meeting at the Paris Exposition.

It is proposed to hold a meeting of the American Institute of Electrical Engineers at the Paris Exposition during the Summer of 1900, and informal negotiations have already passed between that body and the British Institution of Electrical Engineers, looking to the joint session of the two bodies. It is proposed that the date of the meeting shall be during the week beginning August 13, 1900, as the opening of the International Electrical Congress has been fixed for August 18. Mr. Ralph W. Pope, the secretary of the Institute, is anxious to ascertain whether a sufficient number of members will be in Paris at the date named, and requests all members to communicate with him at 22 Cortlandt street, New York, promptly, and announce their intentions regarding the matter. It is not unlikely that some of the other American engineering societies will also meet at Paris next Summer.

DIVIDEND.

The Boston Electric Light Company has declared a quarterly dividend of $2 per share, payable January 15. Transfer books close January 1 to 15, inclusive. This is an increase of 50 cents over the previous regular quarterly dividend rate, placing the stock on an eight per cent yearly interest basis.

PERSONAL.

Mr. John F. Carroll, of Montreal, P. Q., was a recent visitor to New York city.

Mr. E. H. Abadie, of the Wagner Electric Manufacturing Company, St. Louis, Mo., is spending a few days in New York city. Mr. Abadie reports a very busy season with his enterprising company.

Mr. Charles W. McDaniel, of the Missouri & Kansas Telephone Company, and Miss Annie M. Richcreek are to be married Wednesday evening, December 27, at Hannibal, Mo. The ELECTRICAL REVIEW extends its congratulations.

Mr. C. H. Wilmerding, of Chicago, has been appointed superintendent of stations for the Third Avenue Railroad Company, of New York city. Mr. Wilmerding enjoys a high reputation as an electrical engineer, and the Third Avenue Railroad Company is to be congratulated on securing his services.

Mr. C. O. Baker, Jr., the platinum refiner, who has been on the Pacific coast for several weeks, is expected to return to New York in time for the holidays. While at the Coronado Beach Hotel, Mr. Baker enjoyed a number of very fine fish dinners and remembered his friends in the East by sending them bills of fare containing the peculiar names of the fish on which he feasted.

Mr. Edward L. Leeds, of 39 Victoria street, London, general European agent for the Brown Hoisting and Conveying Machine Company, has been spending a few weeks in the United States, and sailed for London last Wednesday. While in New York Mr. Leeds was the guest of Mr. W. A. Stadelman, the New York manager of his company. The foreign business of the Brown Company is phenomenally large, and extends to every capital of Europe.

OBITUARY.

Mr. E. V. Cherry, of Cincinnati, Ohio, for many years at the head of the Standard Electrical Company, died on Sunday, December 17. Mr. Cherry was a widely known electrical man, was one of the pioneers in the business, and leaves a large circle of friends to mourn his decease.

Erie Telephone Company Increases Its Capital.

A certificate of increase of capital stock of the Erie Telegraph and Telephone Company from $5,000,000 to $15,000,000 was filed at Albany, N. Y., on December 16.

NOTES ON LIGHT.

BY WILLIAM ROLLINS.

NOTE LXXVIII—HYDROGEN IN TESLA-LIGHT TUBES.

Tesla, the father of vacuum-tube lighting, has said the higher the vacuum the better the light. This is an important fact in a system which is to be a light of the future. A second is this: The vacuum should be hydrogen and adjustable. This obvious deduction from what I have shown about this gas and X-light is mentioned now rather than later, when I shall describe experiments with Tesla light, because I should not like to see the idea patented for those of us "who serve the dream" know them unwise.

NOTE LXXIX—CHEMICAL HYDROGEN REGULATORS OF CHEAP X-LIGHT TUBES.

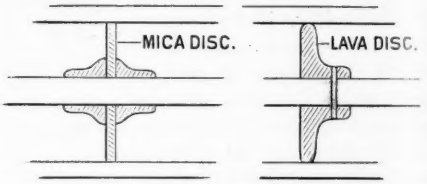
It is possible to buy an X-light tube for $5, which leaves the makers so small a profit they have to reduce the platinum to the lowest. They are, therefore, unable to use my intermolecular regulators of platinum or palladium, and either have none or the ordinary potash or the oxygen bulb, the life of these tubes is in consequence very short as they die of cathode exhaustion. I gave my tube-makers two years ago a formula for a chemical regulator which liberated hydrogen, but as their work is chiefly in furnishing the finest tubes to hospitals they have little use for it. I now publish the method, as it is worthy of extended use in connection with low-cost tubes, as it increases their price only five cents. I have shown in other notes that X-light was a hydrogen phenomenon for practical purposes and that in consequence it was necessary to introduce this gas. What therefore is necessary to revive cheap tubes is to have some chemical in a small supplementary bulb which will liberate hydrogen at a temperature low enough so the glass bulb will not soften in the process.

Sodium formate will do this.

NOTE LXXX—SUPPORTING THE STEMS OF X-LIGHT TUBES.

In Note lxi, it was said that the universally-used glass wrappings about the stems of the terminals in a vacuum tube were not only unnecessary but undesirable. In Fig. 56 a tube was shown with strong, bare stems supported by diaphragms blown in the glass. As I aim to make a tube which will be easy to construct, as well as durable, graceful and efficient, this kind of support has been abandoned, for it took a good workman to make it, and sometimes the glass would crack at the seal. The stems are now supported by collars of mica, or what may prove better, by rings of molded lava, as suggested by Mr. Heinze. This construction applied to my rotary and cooled target tubes is shown in Figs. 64 and 65, and in detail in Figs. 66 and 67. In these illustrations the electrolytic regulators are shown forming the support for the cathode stems, thus doing away with one piece of platinum wire. I have used this position for the platinum heat regulator for a long time, but, on account of the length of the platinum, it has been criticised as making the vacuum tube more liable to injury than when the regulator is placed on the side. The electrolytic regulator is now so short that this objection is without force. Fig. 68 shows the details of such a regulator.

FIG. 64.—NOTES ON LIGHT—SCALE ONE-QUARTER SIZE. TUBE WITH ROTARY TARGET.



FIGS. 66 AND 67.—NOTES ON LIGHT—SCALE FULL SIZE. DETAILS OF FIGS. 64 AND 65.

FIG. 65.—NOTES ON LIGHT—SCALE ONE-QUARTER SIZE. TUBE WITH WATER-COOLED ANODE.

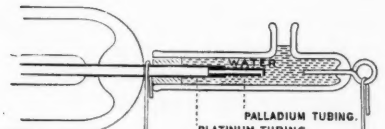


FIG. 68.—NOTES ON LIGHT—DETAILS OF ELECTROLYTIC REGULATOR.

Verdict for a Street Railway Company.

A damage suit of Amy Thornton against the Louisville (Ky.) Railway Company was tried in the law and equity division of the courts of that city recently, and resulted in a verdict for the defendant. The plaintiff alleges that she boarded one of the defendant's cars and paid her fare. She says that she had burst a blood vessel in her foot, and that the wound was bleeding, and for this reason the motorman put her off the car without refunding her money.

New York Electrical Society.

The 200th meeting of the society will be held at the College of the City of New York, Twenty-third street and Lexington avenue, on the evening of Thursday, December 21, at 8 o'clock. Mr. John W. Lieb, Jr., past president of the society, will give a talk on "Electricity Supply from Central Stations, Covering Recent Developments in the Construction and Operation of Central Stations in Our Great Cities." This phase of electrical development is one of the most important now occupying the attention of engineers, in view of the probable future supply of all light, heat and power from such centres.

American Society of Mechanical Engineers.

The result of the election of officers held at the recent New York meeting of the American Society of Mechanical Engineers was as follows: President, Charles H. Morgan; vice-presidents, E. D. Meier, George R. Stetson, B. H. Warren, Jesse M. Smith and Stevenson Taylor; treasurer, William H. Wiley; secretary, F. R. Hutton.

Electric Railway Stopped By Drought.

A severe drought is prevailing in the state of Connecticut, and has caused great trouble to the New York, New Haven & Hartford Railway Company. Many of the regular watering tanks are useless and the greatest economy of water has to be observed. At Berlin, where the power station of the electrically-operated section between New Britain and Hartford is located, the water supply failed completely last week, causing a shutdown for several hours.

The "Electrical Review" Booming.

TO THE EDITOR OF ELECTRICAL REVIEW:

I can not help congratulating you upon the current issue of your most estimable paper. The typographical improvement of its general make-up and of its advertisements is very marked. Pages four and five, especially, are strikingly set up, stand out and give a character to each concern in a way that should be appreciated. The ELECTRICAL REVIEW is certainly booming.

Wishing you continued success for the New Year, I am,

Yours very truly,
W. F. OSBORNE.

New York, December 15.

Small Alternating-Current Motors Wanted.

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you kindly notify your advertisers in your valuable paper that one of my clients will be in the market for several hundred one-eighth horse-power alternating-current motors, and I should be pleased to enter into correspondence with such parties.

Yours,
WM. HOWARD PAINE.

Providence, R. I., December 5.

A MODERN FIRE-ALARM SYSTEM.

THE PROTECTIVE EQUIPMENT OF THE WASHINGTON LIFE INSURANCE BUILDING, NEW YORK CITY.

In the early days of the century the method of giving an alarm of fire was by vigorous shouting and the furious ringing of bells in churches and other public buildings when access could be had to the ropes which controlled them. Even within the memory of men still living there was a system of signal towers in New York city, in each of which was perched a watchman. When he saw suspicious smoke or lights, by sounding out certain signals on the bell, the volunteer fire department would assemble and, barring the usual fighting between rival companies, do its best to extinguish the fire. With the advent of steam fire engines and a

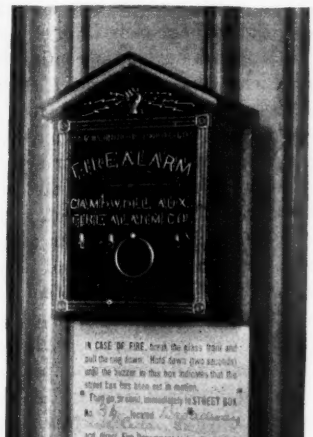


FIG. 1.—A MODERN FIRE-ALARM SYSTEM.

paid fire department came the necessity for some quicker method of notification, and a crude method of telegraph signals was introduced. This has developed into the highly perfected system of to-day with alarm boxes on convenient street corners, and all circuits underground and out of the way of injury or molestation.

Some one has observed that seconds at the beginning of a fire are more valuable than minutes later on. In this day of gigantic buildings the time required for a messenger to go from the place where fire is discovered to the nearest street box and send in an alarm is often a matter of minutes rather than seconds. The latest improvement in fire-signalling apparatus is one which, in effect, brings the alarm box into the building that is to be protected, and makes it immediately accessible to any person discovering an incipient fire. This system is installed with great perfection of detail in the new office building of the Washington Life Insurance Company, in New York city.

The building, which is situated at the corner of Broadway and Liberty street, is twenty stories high above the ground and has two floors below the street level. The nearest fire alarm box is about eighty yards away from the front door and is attached to a lamp post at the corner of Broadway and Cedar street. On each floor of the building in the main hall, near the landing of the elevator, is attached one of the little boxes shown

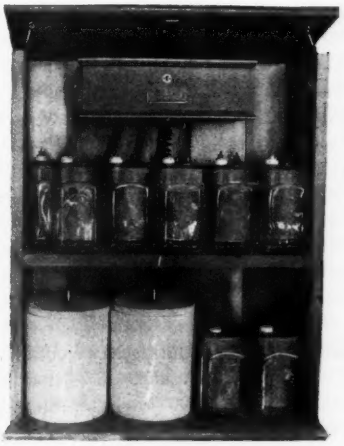


FIG. 2.—A MODERN FIRE-ALARM SYSTEM.

in Fig. 1. This contains a simple sliding contact switch, operated by a ring which may be pulled down only after the glass in the front of the box is broken. To send in an alarm of fire, all that is necessary is for any person to break the thin glass front and pull down the ring. After pulling down the ring, a buzzer in the box pulled indicates that the street box has operated. The twenty boxes in the building are connected in two circuits, leading back to an arrangement shown in Fig. 2, which is located in the sub-cellar near the engine room. In Fig. 3, the box shown in the upper part of Fig. 2 is illustrated in detail. As will be noticed there are two sets of batteries in the case shown in Fig. 2, one of them being an open circuit battery of ten cells, which is relied upon for the main signal, the other being a closed circuit Gordon-Burnham battery of two cells which keeps a constant small current flowing through the various parts of the system for testing and indicating purposes. In the relay box shown in Fig. 2 are two relays, one of these is connected in the main circuit so that if a break occurs anywhere, it releases its armature and sets an electric bell connected outside to ringing as a warning of trouble on the circuit. The other relay is closed when one of the boxes is pulled and transmits the signal to the engineer's room and also to that of the superintendent of the building, showing upon an annunciator the locality of the box that has been manipulated.

The street alarm box, instead of being of the pattern in which the

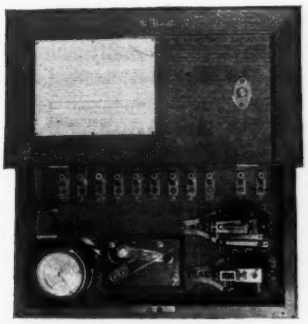


FIG. 3.—A MODERN FIRE-ALARM SYSTEM.

signal is given by pulling down a latch, thus winding a spring and starting the clock-work mechanism of the box running, has a spring normally under tension. The box may be set in action either by a trigger operated by hand when the door is open in the usual way, thus permitting the police or citizens to send in an alarm of fire in the customary manner, or it may be released by an electric signal from the system in the building described above. On the top of the box is an arrangement of electromagnets which operate, when the circuit from the main battery in the case shown in Fig. 2 is closed, through them to release the mechanism of the alarm box and send in the alarm. It will be seen that by this system the manipulation of one of the small boxes anywhere in the building not only gives a local alarm, but instantly calls the fire department through the street alarm box.

Space forbids here an extended mention of the numerous ingenious devices used in connection with the system to preserve the continuity of the circuits, to indicate instantly the presence of crosses, leaks or openings, and to render the whole system as nearly as possible automatic. Combined with the alarm system is an ingenious arrangement of fire hose, two lengths of which are permanently attached to high-pressure water-pipes on each floor of the building. This hose is wound on reels, which form the equivalent of hand wheels on large globe valves attached to the water main. The operation of the device is such that when the hose is pulled out for use it opens the valve, and by the time its full length is run out water is flowing. Attached to each hose reel is an electric contact-making arrangement which also signals through the alarm system described above, so that if it is forgotten to send in the alarm in the hurry and excitement of a fire the act of unreeling the hose itself accomplishes the signalling to the employés of the building.

It should not be thought from the foregoing that these elaborate precautions indicate any great fear of fire on the part of the owners of the building, as it is a thoroughly modern structure, composed entirely of steel, terra cotta and other non-burning materials, but wherever combustibles are stored there is always danger of fire, and this seems to justify the installation of so elaborate a system. This method of alarm signalling is that of the Manhattan Fire Alarm Company, which controls the Gamewell auxiliary system in the Borough of Manhattan, New York city. The same method of fire signalling has been installed in many other office buildings in New York city, and in numerous hotels, public institutions, apartment houses, theatres and factories.

A Pacific Cable Bill.

The Secretary of the Navy has prepared a draft of a bill providing for the construction of a Pacific cable under the supervision of the Navy Department. It is stated that the bill was prepared at the request of Senator Hale, chairman of the Committee on Naval Affairs. The round sum of $11,000,000 is appropriated by the bill, $10,000,000 being the estimated cost of laying and equipping the cable, and $900,000 the estimated cost of the first year's maintenance. In the draft submitted it is provided that the cable shall run from San Francisco to Honolulu, thence by way of the Midway Islands and the Island of Guam, or by any other route deemed best by the Secretary of the Navy, to the cities of Manila and Iloilo in the Philippine Islands. The operation and control of the cable is transferred by the terms of the bill to the Postmaster-General upon its completion.

New York Elevated Railroad.

The board of directors of the Manhattan Elevated Railway, New York city, met a few days ago and declared the regular quarterly dividend of one per cent. The vice-president and general manager, Mr. Alfred Skitt, said that preparations for the change in motive power were proceeding satisfactorily. The excavation for the great power-house in East Seventy-fourth street was steadily going forward, despite the difficulties created by the bed of solid rock encountered. He felt confident that part of the railway would be under electric operation within one year.

Stray Currents and the Stability of Structures.*

The electrical current, though a century old, has lost but little of the mystery which surrounded its early years. The nature of electro-motive force, the seat of this so-called "force" in a voltaic element, and the theory of the cell itself, are matters that are still open to discussion. Though much has been written at home and abroad about these electrical fundamentals, there is evidence that something remains to be done, and much to be said, before a settlement is reached.

As a consequence of this incompleteness of knowledge, the current itself is a phenomenon whose intimate nature is very imperfectly known. But this need not exert any depressing influence on the student of science, for the same may be said of many other subjects about which, nevertheless, we are accustomed to write very fluently, such as matter, force, energy and gravitation. It is, no doubt, desirable in the interests of the philosophy of science to have clear concepts about the constitution of the world that surrounds us; but, on the other hand, such familiar acquaintance with the inner workings of Nature is not necessary for the successful application of any physical agent to the wants, comforts and superfluities of life. The Professor of electrical theory may, indeed, be expected to enrich the world with his speculations about the origin and mechanism of the electrical current, but the ordinary man finds more than sufficient occupation for his professional and leisure hours in dealing with its various forms, transformations and vagaries.

While the current freely acknowledges the authority and supremacy of Ohm's law, it shows itself now and again capable of astonishing even an expert by its caprices, and setting his detective qualities at defiance for a time. This is due in most cases to the provoking tendency which it has for making the acquaintance of neighboring conductors, whether linear or massive, solid or liquid. It threads its way through the most tangled network as easily as through a vulgar bifurcation. Not only does it take cognizance of the heart and surface of a conductor, but makes itself felt in the surrounding region, which it fills with a whirl of magnetic lines. It welcomes moisture, for then it can go far abroad and break into countless stream lines of every degree of curvature. Last year Professor Rücker was able to detect the magnetic field due to an overhead trolley wire a mile and a half away. Sir William Preece, while experimenting in 1894 on wireless telegraphy, found currents on the surface half a mile back of the earth-plates, which were 1,200 feet apart.

Magnetic lines tend to spread out from the conductor as if in search of the stray filaments from other "fields," with which they are ever ready to interlace. Such intrusion of lines and insidious currents usually causes irritation in the physical laboratory and annoyance in the magnetic observatory. The introduction of dynamos a few years ago in St. John's College, Oxford, interfered considerably with the work of the students, and it was not until the laboratory was screened from the excessive curiosity of the dynamo lines that the disturbance was eliminated. The screening was effected by building up a double wall of separation between the rooms and filling the enclosed space with scraps of iron. The same mode of protection is not available for magnetic observations, as iron can not be used in their construction. In building the Toronto observatory, the stone was magnetically tested, blocks showing traces of iron being rejected. In the Cavendish laboratory, Cambridge, even the hot-water pipes are made of copper.

Despite the care bestowed on the erection of observatories, and the sums spent on their equipment, several of them have been so far interfered with by the proximity of wires carrying heavy currents that they have suspended, or are on the point of suspending, their observations. Our own national observatory at Greenwich is threatened in this way, the magnetic instruments being disturbed by the passage of trains on the London Electric Railway, although 4½ miles away. The Toronto observatory is worse off, being within 700 feet of the electric cars. Here work has been discontinued, and a valuable record thereby interrupted. The same is, unfortunately, true of the Naval Magnetic Observatory on the Georgetown Heights, Washington, the trolley being 1,400 feet distant. Professor Mascart repeated the same lamentable story before the Académie des Sciences a twelve-month ago in respect to the recently equipped observatory of the Parc St. Maur, which is half a mile from the Paris electric tramway. In our case the state of affairs is about to be investigated by a committee appointed by the Board of Trade, and comprising names of the highest eminence. A great deal of assistance is to be expected from their report, always supposing that the problem is soluble. One thing is certain, the electric railway has come to stay, and that its progress can not be stopped on account of its interference with the magnetic observations. There are plenty of places in the world which will always be practically free from the disturbance of stray currents, and if no other remedy can be found, the observatories will have to be moved further afield.

Such a change would have much inconvenience, and, if electric traction systems must be extended, both for the good of companies and the comfort of the public, it is none the less a matter of deep regret that work which has been carried on with scrupulous care for a great number of years, and which is of the highest scientific value, should be permanently interrupted or even temporarily interfered with. We know but too little of the magnetic conditions of our globe to lose any of the few stations in which the magnetic elements and their variations are daily and nightly recorded. From the publication of Gilbert's great work, just 300 years ago, interest in this subject has never been wanting; but we see it to-day taken up in every country with unprecedented eagerness. Every expedition to high latitudes has its full allotment of the finest instruments. Continental countries have, for the most part, been magnetically surveyed. Professors Rücker and Thorpe have done the same for Great Britain. In America, the work has been zealously carried on for years by the Coast and Geodetic Survey. Two large volumes have been published under the direction of Dr. Mendenhall, giving the elements for the cities and a great many country places in the United States, as well as beautiful charts showing the isogonic, isoclinic and isodynamic lines for the epoch 1900.

And still the need is felt for more knowledge, more details, more observations of local peculiarities, including the study of coast lines and rocks away from land. It is only when the continuous records of observatories have accumulated, and data, obtained in the field, greatly increased, that mathematical physicists can, with any chance of success, proceed to discuss these observations; and, integrating them with respect to time and place, draw safe conclusions as to the general distribution of magnetism over the earth. The stray currents which show themselves so unfriendly to magnetic observatories and research laboratories are equally hostile towards our underground system of water-pipes, gas-mains, supports of elevated railroads, anchors of bridges and the like. Escaping from the rails of trolley lines, they make use, on their way back to the central station, of every convenient conductor which they chance to meet. The earth is always a favorite on account of its high conductivity, for which it is indebted chiefly to the moisture which it contains. The embedded pipes, enjoying as they do, on their own account, the same electrical privilege, are pressed into service and made to convey their proportionate share of the returning elements of current. Ohm's law determines exactly how much each conductor will carry, and likewise how far it will have to bear its electrical load without assistance.

As long as a current is confined to a conductor it produces no evil effect; but it is otherwise at the places of entrance and exit; it is there the damage is done. The former acts as the cathode of a large electrolytic cell, consisting in order of rail, moisture and pipe; the latter acts as the anode of a cell made up of pipe, moisture and rail. When the current passes, the salts dissolved in the moisture are decomposed, the products of the analysis appearing only at the terminal metals. At the cathode oxygen is set free as a secondary effect, and the pipe accordingly dissolves. At the anode oxygen, chlorine and various acid radicals make their appearance. These are the chief mischief workers. They vigorously attact the metal, corrode it, and waste it away. The amount of corrosion will depend upon the strength of the current flowing from a given area and the nature of the salts contained in the soil. The chlorides stand first in order of activity, then come the nitrates, and last of all the sulphates. Most soils contain soluble salts of potash, soda and ammonia.

It has been estimated that a current of an ampere will dissolve in a year 20 pounds of iron or 75 pounds of lead. But it does not require an ampere to effect such havoc; a mere directive electro-motive force is sufficient to start the electrolysis. The work of corrosion will then proceed slowly, but its cumulative effect will not be a negligible quantity. Fortunately, there is a remedy for the insidious

*From London *Engineering*.

and pernicious work of stray milliamperes; and it is as simple as effective. The electrical tyro will name it at once, and so probably will the least technical member of a board of directors. Avoid all "earths," they will say; make your circuit metallic throughout, and you will have the best protection possible for all underground conductors. The financial committee will also be found highly appreciative of the efficiency of the remedy; but they will tell you that the market price of copper is so high that they can not entertain the idea of duplicating the conductors. This being the case, all that can be done for the present to check the fragmentary tendencies of the return current is to use heavy bonding.

There is hope, however, that the radical remedy may yet be applied by the help of that new product of the electric furnace, aluminum. It is cheap, light and of good tensile strength. Its conductivity, it is true, is only 63 per cent of that of copper, but this drawback may be overcome by a suitable increase of cross-section. Further experiments and trials are needed to test how far aluminum may successfully replace copper for insulated as well as for bare conductors, both overhead and underground. If they confirm present expectations, we may soon see an end put to the destructive effects of stray currents.

The latest outcry against them comes to us from New York, where certain authorities seem concerned for the stability of the Brooklyn bridge and the adjacent sections of the Third avenue elevated railroad. Previous to the recent adoption of electricity, the bridge cars were operated by cable; but even then currents escaped from the Brooklyn trolley lines, crossed the bridge and entered the elevated structure. From this they passed into the underground system of pipes, and thence back through the earth and the East River to the power station in Kent street, Brooklyn. Since the trolley cars have been allowed to cross the bridge, and the cable discarded for electric traction, the trouble has been aggravated and extended. Complaints having been made from time to time by the many parties interested, the State Board of Railroad Commissioners have at last caused an inquiry to be made as to the seat and extent of the evil. The investigation was intrusted to Mr. C. R. Barnes, an electrical expert, who, after months of testing and examining, has handed in a valuable report. As expected, he found a current constantly flowing from the bridge terminal into the iron structure of the City Hall station of the elevated road. On leaving the supporting columns for the earth, it was found to flow under a pressure of 2½ volts. This maximum difference of potential fell off with distance from the bridge. The currents were followed to the gas-mains and water-pipes in Park row and Chatham square, where evidence of electrolytic action was found, as well as at the bases of the columns in the vicinity of the Bridge. It must be remembered that it is the amperes which do the damage, and that they depend not only on the voltage, but also on the resistance of the intervening medium.

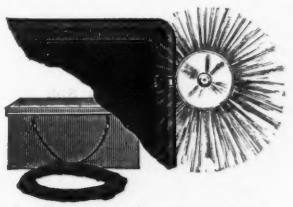
As to the bridge itself, the chief seat of danger is at the anchors, of which there are four on each side of the river, weighing 23 tons apiece. In the case of leakage, they would act as massive anodes, the bolts and fastenings gradually deteriorating. It was not thought advisable to suspend the traffic between the two boroughs in order to allow excavations to be made, so that the actual condition of these parts, which are of such vital importance to the stability of the bridge, has not been ascertained. If the concrete in which they are deeply imbedded has proved impervious to moisture, very little injury can have been done; but if otherwise, even to a small degree, the consequences must be disastrous in course of time.

Mr. Barnes concludes his report by the comforting statement that he finds no serious damage to have been caused by electrolysis to the supports of the Manhattan Railway Company's works. He, however, recommends that the structure be immediately placed in such condition that at no point will it be positive to other conductors in the ground more than a volt. But the directors of the Manhattan Company may reasonably object that it is not for them to apply the remedy since they are the sufferers. The cause of all the injury done is leakage from the bridge. Let that be abolished by the Brooklyn Rapid Transit Company, and the evil will disappear at once.

In justice to this company, it must be said that they have already taken means to minimize the trouble. They have re-tracked their whole system with massive and heavily bonded rails, and quite recently the eight lines of the Bridge were electrically connected together at the Brooklyn side with a stout copper cable, the other end of which was thrown into the East River and there fastened to large masses of iron. Should these improvements fail to check the expansiveness of the return current, the use of the rails must be abandoned and the circuit insulated throughout. But by that time we shall know more about the mechanical and electric properties of aluminum. Present prospects encourage the hope that it will show great adaptability to the wants of electrical engineering, and perhaps prove the panacea of our present electrolytic troubles.

An Electric Carriage Light.

A neat and efficient dashboard light for carriages or automobiles is illustrated in the accompanying engraving. The lamp is at the focus of a silvered parabolic reflector, which is adapted to be attached to the dash-



AN ELECTRIC CARRIAGE LIGHT.

board, the box containing the batteries being conveniently placed under a seat in the vehicle. A flexible cord completes the connection. The batteries used are of a dry type, readily replaced at small cost when exhausted. Of course the outfit can be used for many other purposes than that for which it is designed, furnishing a steady and brilliant light. It would make an excellent reading lamp. The Ohio Electric Company, of Cleveland, manufacture this appliance as well as many other battery lighting outfits.

Electric Vehicle Company's Construction Department Burned.

The construction department of the Electric Vehicle Company, situated in East Forty-third street, New York city, was partly destroyed by fire on the evening of December 16. No less than 43 new automobiles were consumed. The fire broke out in a room used for the storage of rubber tires, etc. Several finished electromobiles on the lower floor, as well as some of the machinery, were saved. The loss is fully covered by insurance, but the destruction of the vehicles will, of course, cause a serious delay in deliveries to the Electric Vehicle Transportation Company, the concern operating electric cabs in New York city, for which they were intended.

Wall Street and the Electrical Stock Market.

The week began with a liquidation of speculative holdings of securities which continued throughout the week, being especially marked on Wednesday. Mr. Keene, as a bear operator, is credited with having made a fortune on the slump in stocks. A number of developments occurred in the week which calculated to unsettle confidence. Chief among these was the exceedingly unsatisfactory progress of the war in South Africa. Owing to the closer relations that have developed between the American and foreign money markets, it is evident that the United States will be called upon to extend liberal financial assistance to London for the South African war. Sterling exchange advanced almost constantly during the week.

On the New York Stock Exchange General Electric closed the week at 118½ bid and 119 asked, a loss of 5½ points. Metropolitan Street Railway, of New York, closed at 167 bid and 167½ asked, a loss of 16½ points and 26 points in two weeks. Third Avenue Railroad, of New York, closed at 126 bid and 127 asked, a loss of 19 points and 27 points in two weeks. Brooklyn Rapid Transit closed at 77¼ bid and 77½ asked, a loss of 4 points. Manhattan Railway, of New York, closed at 96½ bid and 97 asked, a loss of 5 points.

On the Boston exchange American Bell Telephone closed at 340 bid and no asked price, a loss of 9 points in the bid price. Erie Telephone closed at 100 bid and 103 asked, a loss of 3 points.

On the Philadelphia exchange Union Traction closed at 39 bid and 39¼ asked, a loss of ¼ point. Electric Company of America closed at 12⅞ bid and 13 asked, a loss of ⅞ of a point.

On the curb or outside market in New York Electric Vehicle closed at 63 bid and 68 asked, indicating no change for the week. Electric Boat closed at 25 bid and 28 asked. a loss of 1 point. Electric Axle closed at 6⅜ bid and 7 asked, a gain of ¾ of a point.

Wall Street, December 16.

The Chicago Electrical Association.

At the forthcoming meeting of the Chicago Electrical Association, on January 5, 1900, Mr. H. R. King will read a paper on "Modern Construction of Dynamo-Electric Machinery."

Telephone News .....and Comment

At a meeting of the capitalists interested in the Federal Telephone Company, held in Cleveland, Ohio, it was decided to cooperate with the Telephone and Telegraph Company of America, as soon as the lines of the latter company have been constructed westward to the borders of Ohio.

The United Telephone and Telegraph Company, which recently secured control of the Delmarvia Telephone Company has absorbed the Maryland Telephone and Telegraph Company, of Baltimore, and the Pittsburgh and Allegheny Telephone and Telegraph Company, of Pittsburgh.

The Washington Telephone and Telegraph Company, which was recently chartered, will apply to Congress for a franchise to establish an independent exchange in Washington. This will also become a part of the system being built up by the United Company, and a long-distance line between Baltimore and Washington will be built. Henry A. Parr is president of the United Company and one of the directors, the others being Alexander Brown, James Bond, S. Davies Warfield and Thomas J. Hayward.

The Committee on Corporations of the Allegheny, Pa., Councils will soon consider six ordinances asking for franchises for three different telephone companies which desire to enter that city. Four of the ordinances are for the Home Telephone Company, one for the Independent Telephone Company, of the United States, and one for the Pittsburgh & Allegheny Telephone Company. The committee has not met for some time, and it is expected that some action will be taken on the telephone ordinances.

The new American Telegraph and Telephone bonds will be 30-year 4s, of which $5,000,000 will soon be issued. They will be issued under the general laws of New York, which permit a mortgage issue as large as the stock and a collateral bond issue equally large. The company will have no end of collateral to hypothecate for loans, in the stocks of subsidiary Bell companies, some of which already have a considerable bonded debt. How much realty the American company can show to mortgage is unknown. There is more or less of it.

At a meeting of the stockholders of the United Telephone and Telegraph Company, held at Baltimore yesterday, the Maryland Telephone and Telegraph Company, of Baltimore, and the Pittsburgh and Allegheny Telephone and Telegraph Company, of Pittsburgh, were absorbed. Both companies have been controlled by interests acting in harmony with the United Company, which was chartered under the laws of New Jersey, with a capital stock of $5,000,000, to absorb telephone exchanges independent of the Bell company, and to provide long-distance connections.

Articles of incorporation have been filed with the Secretary of State of New Jersey of the Seashore & Delaware River Telephone, Telegraph and Cable Company. The company is part of a system to be established by the Telephone, Telegraph and Cable Company of America, and is capitalized at $100,000. The company will build a telephone line beginning at the foot of Morgan street, Jersey City, and through Jersey City, Bayonne and Elizabeth, and along the Atlantic coast to Atlantic City and Cape May, and thence to Camden. The incorporators are James E. Hayes, Camden; George W. Beers, Fort Wayne, Ind., and John. B. Stauffer, Philadelphia.

An Expanding Telephone Manufacturing Company.

It is very pleasant to chronicle such rapid growth of a business enterprise as that covering the experience of the Sterling Electric Company. This concern began business in Chicago less than two years ago with limited capital and in exceedingly small quarters. So spontaneous was the reception with which its apparatus met, that it was twice compelled to enlarge its plant, and finally, finding it impossible in its last location, No. 71–73 W. Adams street, to keep up with the volume of business, which was constantly increasing, it acquired the property in which the new factory is located at LaFayette, Ind., and now claims to have the largest and best equipped plant in the country used exclusively for the manufacture of telephone apparatus.

The building is of three stories, 225 feet long on one street and 150 feet on the other, and is 60 feet wide its entire length. The Sterling company occupies the whole building, which is thoroughly equipped with the latest and most approved machinery and many labor-saving "wrinkles" for the rapid and satisfactory production of their well-known "Bell-style apparatus." Between four and five hundred hands will be employed, and the company expects in the near future to add a full line of high-class telephones to its present product. Other new features will be evolved and produced as rapidly as possible, and with its vastly increased facilities it will better be able to satisfy the flattering demand for its apparatus.

Express Telephone Lines.

The construction gang of the American Telegraph and Telephone Company, which is laying a new line of direct wires from New York to Boston, has reached the Connecticut River. The towers are being constructed upon which the wires are to be strung across the river, at "Blow Hole," in Cromwell on the west side and midway between Glastonbury and Portland on the east side.

These towers will be the unique feature in electric line construction. They are of steel on concrete foundation, rising to a height of 185 feet above the river level to carry the wires over the tops of the highest masts that may pass in the river traffic.

The new line is itself interesting as showing the enormous development of the business of long-distance telephony. In laying it, the company has departed from every precedent formerly observed for its telephone business. The line is analagous to the "limited" express service of the railroads, inasmuch as it is designed for the exclusive use of New York and Boston subscribers.

Ten No. 8 copper wires, a size larger than any that has been used by the Southern New England company, are strung as nearly as practicable on a bee-line from New York to Boston, avoiding all highways and keeping clear of cities and large towns. Before beginning the line the company went through and bought or leased a right of way overhead of private property for practically the entire distance of the line.

No submerged cables will be used. On all the former routes from three to seven cables have been put in the circuit. Trouble has occurred from these cable sections being broken or torn up by passing boats.

The object of steering clear of cities, highways and railroads is to keep the line free from all danger of currents that might interfere with ease of conversation or continuous jarring that would shorten the life of the wires and give them a tendency to break. The location of the line in different territory from that of former routes, too, is advantageous from the fact that in the case of heavy storms it is improbable that both would catch the full force of the storm centre.

The line, when finished, will be the most expensive for the mileage of any that has been constructed for telephone purposes, and the fact that such an investment of capital was warranted by the New York and Boston through business only shows how important a part the telephone is playing in modern business. The demand for the new equipment has grown out of the custom of renting out the long-distance wires by the "block system." Many large business houses have the arrangement under which a wire between certain points is given to their use exclusively for certain specified periods each day. The custom prevails, for instance, for the routine communication between the New York office of a concern and its "country" factory.

There will be no intervening switchboards on the new line, so that the service can not be tapped for the use of intermediate points. In long-distance use heretofore the plan has been to run the line between the switchboards in the principal exchanges along the route.—*Pittsfield Journal.*

BUSINESS NOTES.

Schiff, Jordan & Company, New York, the well-known dealers in imported carbons, report that their "Ship" brand carbons are being more and more extensively used in inclosed arc lamps. This company handles electrical supplies of every description.

The Wheeler Reflector Company, 18 to 24 Washington street, Boston, Mass., will send a well illustrated catalogue of reflectors to inquirers. The Wheeler system of reflectors is adapted to all uses, and is made in numerous special designs for church, store and house lighting.

The Central Electric Company, Chicago, announces an excellent selection of electrical material for the holiday trade. It requests customers to ask for special catalogues upon this subject. This company also is advising the trade that it will remember all friends by a very useful article. This being of a 20th century nature will be mailed between Christmas and New Year's.

The Standard Air-Brake Company, of this city, has recently added to the export business of the United States by making large shipments of its air brakes to French and German electric street railways. The new platform and handle switch recently perfected by this company is a particularly fine piece of mechanism. The air-brakes of this company in use on the Third Avenue Railroad are giving fine satisfaction, and particularly please the motormen.

British Thomson-Houston Company's New Plant.

It is stated that the British Thomson-Houston Company, one of the foreign branches of the General Electric Company, will erect at once, at Rugby, England, a manufacturing plant to cost about $2,500,000. About 20 acres of land have been secured and plans for the various buildings are now in preparation. The demand for American goods is so great in the British Isles just now that the English representatives of the company petitioned for this plant. Only the smaller machines will be built there, the larger ones being exported from the United States, as is done now. It is not known yet what the plans of the company are with regard to labor to be employed in the British works.

ELECTRIC LIGHT FLASHES.

It is announced that the United Illuminating Company has been formed with a capital stock of $200,000 to absorb the present electric lighting companies of Bridgeport, Stratford, West Haven and New Haven, Conn., and to operate lighting system of these four cities and towns as one system.

A charter has been granted by the State Charter Board of Kansas to the Topeka Federal Light, Heat and Power Company, having a capital stock of $1,500,000. The company is privileged to manufacture, distribute and sell electricity and gas in the city of Topeka and its suburbs.

Messrs. Alexander Brown & Sons, managers of the syndicate formed to underwrite the securities of the United Electric Light and Power Company, Baltimore, Md., have requested the members to assent to extend the time for the dissolution of the syndicate until July 1, 1900, owing to the unsatisfactory condition of the market for securities

The Royal Electric Company, of Montreal, Quebec, has just dispatched to the Nova Scotia Steel and Iron Company a complete electric lighting plant, consisting of one 75-kilowatt S. K. C. two-phase generator and a complete equipment of 60 alternating-current enclosed arc lamps. This is said to be the first installation in Canada where an alternating-current generator has its capacity entirely taken up with arc lamps alone.

A copy of the agreement of consolidation of the Utica Electric Light Company and Trenton Falls Electric and Power Company, forming the Utica Electric Light and Power Company, was filed recently with the Secretary of State of New York. The new company will furnish light, heat or power, and light the streets of Utica, Rome and the villages of Prospect, Trenton, Holland, Patent, Oriskany, Whitesborough, New Hartford, Clinton, Frankfort, Ilion, Mohawk and Herkimer, and other villages and towns of Oneida and Herkimer counties. The amount of capital stock is $1,000,000; directors, Henry D. Pizley, Daniel N. Crouse, T. Solomon Griffiths, H. Jesse Brayton, William E. Lewis, of Utica; William G. Phelps, of Binghamton, and Joseph Fox, of New York city.

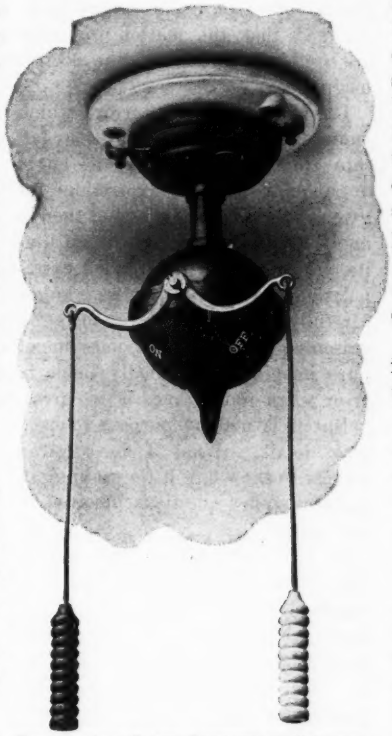


FIG. 1.—ARC LAMP SUSPENSION CUTOUTS.

Arc Lamp Suspension Cutouts.

The rapid adoption of the arc lamp for interior illumination has created a demand for a reliable, as well as an ornamental, suspension device to connect them in circuit. To meet these requirements, the lamp suspension cutout herein described has been designed. Fig. 1 illustrates a style which was especially designed for use where the ceilings are comparatively high. This form can be furnished in any length so as to permit the suspension of the lamp at any desired distance from the floor. Fig. 2 illustrates another form designed to meet the requirements where the lamp is to be suspended from a low ceiling. This form is very compact, it being but six inches over all. Fig. 3 gives a view of this suspension installed, connecting in circuit a modern arc lamp.

The switch mechanism of the cutout is so arranged that when the black handle is pulled the light is extinguished and the lamp and its terminals entirely removed from the circuit, thereby avoiding the possibility of shock to the trimmer. When it is desired to light the lamp the white handle is pulled, which immediately places the lamp in circuit. The switch mechanism is quick-acting in both directions, and after passing a given point is entirely beyond the control of the operator, making a positive "on" or "off" contact.

The switch lever is so designed that its centre of gravity is below the point if support, thereby allowing it always to remain in a perfectly horizontal position, preserving the symmetry of the design. These devices are exceedingly neat in appearance, are said to be entirely dustproof, and finished in antique copper, brass, black or other finish to suit the lamps with which they are intended to be used. They are also fitted with a pointer which indicates the "on" and "off" positions. The line terminals are connected to two binding posts on the outside, which are plainly visible in the illustrations, while the lamp terminals pass up through the hollow hook and are connected to two binding posts on the inside, which are easily accessible by lowering the bottom half of the case. All connections can be made without removing the lamp from the hook. The method of working the switch mechanism by cord and tassel, pole or hook, in a vertical plane is a great improvement over the horizontal plane method, which makes it very difficult to throw the switch when the lamp is installed any great distance from the floor.

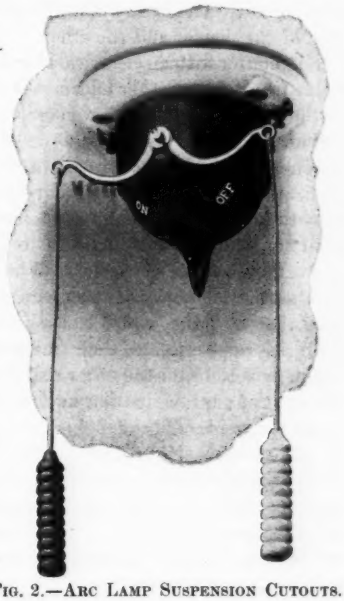


FIG. 2.—ARC LAMP SUSPENSION CUTOUTS.

These lamp suspension cutouts are manufactured for use on constant-potential circuits, as well as series circuits. The interior mechanism, however, is slightly modified, so that the circuit is open while the lamp is cutout, instead of being closed, as is the case when used on series circuits. The Fort Wayne Electric Works, of Fort Wayne, Ind., manufacture these "Wood" arc-lamp suspension cutouts, which are fully described in its recently issued Bulletin No. 1006.

Electrocution Condemned.

At a meeting, on December 11, in New York city, of the Society of Medical Jurisprudence, a paper was read by Roger M. Sherman on "The Law and Science of Capital Punishment by Electricity." Mr. Sherman contended that death by the method now used in New York state had not been proved as yet to be instantaneous. "The time will come," he said, "when the dynamo will have to be supplemented with an axe." Most of those who discussed the paper were in favor of a continuance of present methods, although one doctor spoke in favor of the guillotine.

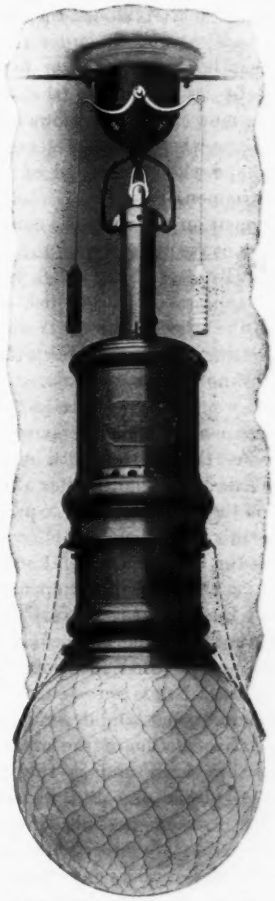


FIG. 3.—ARC LAMP SUSPENSION CUTOUTS.

THE HIGHEST AIM OF THE PHYSICIST.*

BY PROF. HENRY A. ROWLAND.

(Concluded from page 381.)

Hence the properties of the ether are of ideal simplicity and lead to the simplest of natural laws. All forces which act at a distance, always obey the law of the inverse square of the distance, and we have also the attraction of any number of parts placed near each other equal to the arithmetical sum of the attractions when those parts are separated. So also the simpler law of etherial waves which has been mentioned above.

At the present time, through the labors of Maxwell supplemented by those of Hertz and others, we have arrived at the great generalization that all wave disturbances in the ether are electromagnetic in their nature. We know of little or no etherial disturbance which can be set up by the motion of matter alone; the matter must be electrified in order to have sufficient hold on the ether to communicate its motion to the ether. The Zeeman effect even shows this to be the case where molecules are concerned and when the period of vibration is immensely great. Indeed the experiment on the magnetic action of electric convection shows the same thing. By electrifying a disk in motion it appears as if the disk holds fast to the ether and drags it with it, thus setting up the peculiar etherial motion known as magnetism.

Have we not another case of a similar nature when a huge gravitational mass like that of the earth revolves on its axis? Has not matter a feeble hold on the ether sufficient to produce the earth's magnetism?

But the experiment of Lodge to detect such an action apparently showed that it must be very feeble. Might not his experiment have succeeded had he used an electrical revolving disk?

To detect something dependent on the relative motion of the ether and matter has been and is the great desire of physicists. But we always find that, with one possible exception, there is always some compensating feature which renders our efforts useless. This one experiment is the aberration of light, but even here Stokes has shown that it may be explained in either of two ways; first, that the earth moves through the ether of space without disturbing it, and second, if it carries the ether with it by a kind of motion called irrotational. Even here, however, the amount of action probably depends upon relative motion of the luminous source to the recipient telescope.

So the principle of Döppler depends also on this relative motion and is independent of the ether.

The result of the experiments of Foucault on the passage of light through moving water can no longer be interpreted as due to the partial movement of the ether with the moving water, an inference due to imperfect theory alone. The experiment of Lodge, who attempted to set the ether in motion by a rapidly rotating disk, showed no such result.

The experiment of Michelson to detect the etherial wind, although carried to the extreme of accuracy, also failed to detect any relative motion of the matter and the ether.

But matter with an electrical charge holds fast to the ether and moves it in the manner required for magnetic action.

When electrified bodies move together through space or with reference to each other we can only follow their mutual actions through very slow and uniform velocities. When they move with velocities comparable with that of light, equal to it or beyond it, we calculate their mutual action or actions on the ether only by the light of our imagination unguided by experiment. The conclusions of J. J. Thomson, Heaviside and Hertz are all results of the imagination and they all rest upon assumptions more or less reasonable but always assumptions. A mathematical investigation always obeys the law of the conservation of knowledge; we never get out more from it than we put in. The knowledge may be changed in form, it may be clearer and more exactly stated, but the total amount of the knowledge of nature given out by the investigation is the same as we started with. Hence we can never predict the result in the case of velocities beyond our reach, and such calculations as the velocity of the cathode rays from their electromagnetic action has a great element of uncertainty which we should do well to remember.

Indeed, when it comes to exact knowledge, the limits are far more circumscribed.

How is it, then, that we hear physicists and others constantly stating what will happen beyond these limits? Take velocities, for instance, such as that of a material body moving with the velocity of light. There is no known process by which such a velocity be obtained, even though the body fell from an infinite distance upon the largest aggregation of matter in the universe. If we electrify it, as in the cathode rays, its properties are so changed that the matter properties are completely masked by the electromagnetic.

It is a common error which young physicists are apt to fall into to obtain a law, a curve or a mathematical expression for given experimental limits and then to apply it to points outside those limits. This is sometimes called extrapolation. Such a process, unless carefully guarded, ceases to be a reasoning process and becomes one of pure imagination specially liable to error when the distance is too great.

But it is not my purpose to enter into detail. What I have given suffices to show how little we know of the profounder questions involved in our subject.

It is a curious fact that, having minds tending to the infinite, with imaginations unlimited by time and space, the limits of our exact knowledge are very small indeed. In time we are limited by a few hundred or possibly thousand years; indeed the limit in our science is far less than the smaller of these periods. In space we have exact knowledge limited to portions of our earth's surface and a mile or so below the surface, together with what little we can learn from looking through powerful telescopes into the space beyond. In temperature our knowledge extends from near the absolute zero to that of the sun, but exact knowledge is far more limited. In pressures we go from the Crookes vacuum still containing myriads of flying atoms to pressures limited by the strength of steel, but still very minute compared with the pressures at the centre of the earth and sun, where the hardest steel would flow like the most limpid water. In velocities we are limited to a few miles per second. In forces to possibly 100 tons to the square inch. In mechanical rotations to a few hundred times per second.

All the facts which we have considered, the liability to error in whatever direction we go, the infirmity of our minds in their reasoning power, the fallibility of witnesses and experimenters, lead the scientist to be specially sceptical with reference to any statement made to him or any so-called knowledge which may be brought to his attention. The facts and theories of our science are so much more certain than those of history, of the testimony of ordinary people on which the facts of ordinary history or of legal evidence rest, or of the value of medicines to which we trust when we are ill, indeed to the whole fabric of supposed truth by which an ordinary person guides his belief and the actions of his life, that it may seem ominous and strange what I have said of the imperfections of the knowledge of physics is correct. How shall we regulate our minds with respect to it; there is only one way that I know of and that is to avoid the discontinuity of the ordinary, indeed the so-called cultivated legal mind. There is no such thing as absolute truth and absolute falsehood. The scientific mind should never recognize the perfect truth or the perfect falsehood of any supposed theory or observation. It should carefully weigh the chances of truth and error and grade each in its proper position along the line joining absolute truth and absolute error.

The ordinary crude mind has only two compartments, one for truth and one for error; indeed the contents of the two compartments are sadly mixed in most cases; the ideal scientific mind, however, has an infinite number. Each theory or law is in its proper compartment indicating the probability of its truth. As a new fact arrives the scientist changes it from one compartment to another so as, if possible, to always keep it in its proper relation to truth and error. Thus, the fluid nature of electricity was once in a compartment near the truth. Faraday's and Maxwell's researches have now caused us to move it to a compartment nearly up to that of absolute error.

So the law of gravitation within planetary distances is far toward absolute truth, but may still need amending before it is advanced farther in that direction.

The ideal scientific mind, therefore, must always be held in a state of balance which the slightest new evidence may change in one direction or another. It is in a constant state of scepticism, knowing full well that nothing is certain. It is above all an agnostic with respect to all facts and theories of science as well as to all other so-called beliefs and theories.

Yet it would be folly to reason from this that we need not guide our life according to the approach to knowledge that we possess. Nature is inexorable; it punishes the child who unknowingly steps off a precipice quite as severely as the

* Address delivered to the Physical Society of America by the President, at its meeting in New York, October 28, 1899.

grown scientist who steps over, with full knowledge of all the laws of falling bodies and the chances of their being correct. Both fall to the bottom and in their fall obey the gravitational laws of inorganic matter, slightly modified by the muscular contortions of the falling object but not in any degree changed by the previous belief of the person. Natural laws there probably are, rigid and unchanging ones at that. Understand them and they are beneficient; we can use them for our purposes and make them the slaves of our desires. Misunderstand them and they are monsters who may grind us to powder or crush us in the dust. Nothing is asked of us as to our belief; they act unswervingly and we must understand them or suffer the consequences. Our only course, then, is to act according to the chances of our knowing the right laws. If we act correctly, right; if we act incorrectly, we suffer. If we are ignorant, we die. What greater fool, then, than he who states that belief is of no consequence provided it is sincere.

An only child, a beloved wife, lies on a bed of illness. The physician says that the disease is mortal; a minute plant, called a microbe, has obtained entrance into the body, and is growing at the expense of its tissues, forming deadly poisons in the blood or destroying some vital organ. The physician looks on without being able to do anything. Daily he comes and notes the failing strength of his patient, and daily the patient goes downward until he rests in his grave. But why has the physician allowed this? Can we doubt that there is a remedy which shall kill the microbe or neutralize its poison? Why, then, has he not used it? He is employed to cure but has failed. His bill we cheerfully pay, because he has done his best and given a chance of cure. The answer is ignorance. The remedy is yet unknown. The physician is waiting for others to discover it or perhaps is experimenting in a crude and unscientific manner to find it. Is not the inference correct, then, that the world has been paying the wrong class of men? Would not this ignorance have been dispelled had the proper money been used in the past to dispel it? Such deaths some people consider an act of God. What blasphemy to attribute to God that which is due to our own and our ancestors' selfishness in not founding institutions for medical research in sufficient number and with sufficient means to discover the truth. Such deaths are murder. Thus the present generation suffers for the sins of the past and we die because our ancestors dissipated their wealth in armies and navies, in the foolish pomp and circumstance of society, and neglected to provide us with a knowledge of natural laws. In this sense they were the murderers and robbers of future generations of unborn millions and have made the world a charnel house and place of mourning where peace and happiness might have been. Only their ignorance of what they were doing can be their excuse, but this excuse puts them in the class of boors and savages who act according to selfish desire and not to reason and to the calls of duty. Let the present generation take warning that this reproach be not cast on it, for it can not plead ignorance in this respect.

This illustration from the department of medicine I have given because it appeals to all. But all the sciences are linked together and must advance in concert. The human body is a chemical and physical problem, and these sciences must advance before we can conquer disease.

But the true lover of physics needs no such spur to his actions. The cure of disease is a very important object and nothing can be nobler than a life devoted to its cure.

The aims of the physicist, however, are in part purely intellectual; he strives to understand the universe on account of the intellectual pleasure derived from the pursuit, but he is upheld in it by the knowledge that the study of nature's secrets is the ordained method by which the greatest good and happiness shall finally come to the human race.

Where, then, are the greatest laboratories of research in this city, in this country, nay, in the world? We see a few miserable structures here and there, occupied by a few starving professors who are nobly striving to do the best with the feeble means at their disposal. But where in the world is the institute of pure research in any department of science with an income of $100,000,000 per year? Where can the discoverer in pure science earn more than the wages of a day laborer or cook? But $100,000,000 per year is but the price of an army or navy designed to kill other people. Just think of it, that one per cent of this sum seems to most people too great to save our children and descendants from misery and even death!

But the twentieth century is near—may we not hope for better things before its end? May we not hope to influence the public in this direction?

Let us go forward, then, with confidence in the dignity of our pursuit. Let us hold our heads high with a pure conscience while we seek the truth, and may the American Physical Society do its share now and in generations yet to come in trying to unravel the great problem of the constitution and laws of the universe.

ELECTRIC RAILWAY NOTES.

The International Traction Company has a force of men placing snow fences along its railway line between Niagara Falls and Buffalo. Several times last Winter the cars were hindered during snowstorms between the power house and city line and Superintendent McDonald decided to avert further trouble.

The Indiana Railway Company, which operates a system of electric lines connecting Goshen, South Bend and Elkhart with branches, has found that it will derive a considerable profit from carrying freight, and has accordingly decided to put on a freight and baggage car, handling package freight of all descriptions between the towns named, in competition with the Lake Shore and Big Four roads.

Although the work of securing consent of the necessary two-thirds of the stockholders of the Albany Railway and of the Troy City Railway Company for the consolidation of the two roads has not been finished, it is so far along that there is practically no doubt that a sufficient number of affirmatives will soon be secured. Already details of plans for the operation of the two roads under the one management are being perfected, and January 1 has been fixed as the probable date of the beginning of the new company's régime. This date, however, has not yet been formally fixed upon. The stock of the United Traction Company is now in the hands of the engravers, and will soon be ready to be issued.

At the annual meeting of the Chicago Union "Loop" Elevated Company a few days ago, the balance-sheet read showed the surplus for the year ended November 30 to be $83,435. The revenue from the tenant roads was $382,317, including $62,500 rental from the uncompleted Northwestern Elevated. The surplus is after the payment of $200,000 as the first dividend of four per cent on the stock. It compares with a surplus of $118,763 for 1898 and $18,892 from October 10, 1897, when the loop was operated, to November 30 of that year. John M. Roach was reelected a director for one year. H. M. Brinkerhoff was elected in place of W. E. Baker, resigned, and L. S. Owsley in place of J. Charles Moore, resigned.

BOOK REVIEW.

"Electric Power Transmission, A Practical Treatise for Practical Men." By Louis Bell. Second edition. Cloth, 505 pages, 229 illustrations. Published by the *Electrical World and Engineer*. Incorporated. New York, 1899. Supplied by the ELECTRICAL REVIEW at $2.50.

Dr. Bell's important work is so well known and has received such hearty commendation from engineer and layman alike that it is hard to find new words wherewith to praise it. The second edition differs from the first in having been revised and brought up to date in many particulars, and by the addition of a chapter on the importance of high voltage and long-distance transmissions. The book is, perhaps, best described in its sub-title—"A Practical Book for Practical Men." The first chapter should be reprinted in pamphlet form as a text book, as it is probably the most simple, lucid and satisfactory explanation of the elementary conceptions of electricity that has yet appeared in the English language.

LEGAL NOTE.

An interesting decision with regard to damages caused by an electric light station to adjoining property has been rendered. The plaintiff, who kept a boarding house, contended that the vibration from the machinery and the noise annoyed his boarders and combined to drive them away. He sought an injunction to restrain the electric light company from such use of its machinery as would drive away his lodgers. The judge denied the injunction, granted $250 damages, and in his opinion stated that a large industry of public utility could not be interfered with by an injunction unless the occasion required extreme relief. If a tenant, who can renew his lease from year to year, deliberately chooses to stay near an established business enterprise he can not be allowed to interfere with the ordinary and legitimate prosecution of that business unless it can be proved to be objectionable to the community at large.

The Brooklyn Rapid Transit Company's earnings for November increased about $92,000 over the same month last year.

ADVANCE INFORMATION

New Incorporations.

JERSEY CITY, N. J.—The Seashore & Delaware River Telephone, Telegraph and Cable Company has been incorporated to build and operate a telephone system; capital, $100,000; incorporators, John B. Stauffer, Philadelphia, Pa.; George W. Beers, Fort Wayne, Ind.; James E. Hays, Camden, N. J.

NEW YORK, N. Y.—The General Telephone and Electric Company, of New York city, has been chartered to manufacture electric, magnetic and telephone appliances; capital, $10,000; directors, Richard C. Weithas, of Brooklyn, and J. M. Dunscomb, Frank M. Holahan and W. H. Carr, of New York city.

COLUMBUS, OHIO—The Morrow County Illuminating Company, with its principal office in Cleveland, was recently incorporated, with a capital stock of $25,000. A branch office will be established at Mount Gilead. The incorporators are E. W. Radder, George W. Cleveland, George R. McKay, N. C. Whipple and M. Fisher.

TAMPA, FLA.—Letters patent have been granted for the incorporation of the Tampa Electric Company, with a capital of $500,000. The company is organized for the purpose of furnishing light, heat and power for railways and other purposes. The incorporators are George J. Baldwin, Peter O. Knight, Eliot Wadsworth, W. H. Blood, Jr., and H. G. Bradlee.

JERSEY CITY, N. J.—The Lehigh Power Company, with its principal office at No. 243 Washington street, Jersey City, N. J., has been incorporated to manufacture electricity for light, heat and power; capital, $500,000; incorporators, George W. Griffith, Henry G. Cavanaugh, Charles N. King, all of Jersey City.

Electric Light and Power.

WEST ORANGE, N. J.—The West Orange Electric Light and Power Company has given notice that it will make application at the next meeting of the South Orange Village Board of Trustees for a franchise to do business in the village. The company will also make an effort, it is said, to secure a franchise in Vailsburgh.

UTICA, N. Y.—The Utica Electric Light Company and Trenton Falls Electric Light and Power Company have consolidated under the name of the Utica Electric Light and Power Company. The new company will furnish light, heat or power to villages and towns of Oneida and Herkimer counties. The capital stock is $1,000,000, and the directors are Henry D. Pizley, Daniel N. Crouse, T. Solomon Griffiths, M. Jesse Brayton, William E. Lewis, of Utica; William G. Phelps, Binghamton; Joseph Fox, New York city.

WATERVILLE, N. Y.—The Waterville Electric Light and Power Company has been chartered to operate in Waterville, and the towns of Sangerfield, Marshal and Augusta, Oneida County; capital, $15,000; directors, Marinus W. Terry and C. M. Wickwire, of Waterville, and H. B. Sweet, of Utica.

NEW BRUNSWICK, N. J.—Articles of incorporation of the New Brunswick Light, Heat and Power Company have been filed in the office of the County Clerk of Middlesex. The company is incorporated by the Newark and Paterson capitalists who recently bought out the New Brunswick Gas Light Company.

FREDERICKSBURG, VA.—Judge A. W. Wallace, of the Corporation Court, has confirmed the sale of the Rappahannock Light and Power Company's property, franchises, etc., here. The amount paid is $2,227.50, and the purchaser is Mr. Charles R. Sickles, of New York. This is the electric light plant that has for some years lighted the streets of Fredericksburg under contract with the council.

LOS ANGELES, CAL.—Articles of incorporation have been filed of the Boyle Heights Electric Company. Its purpose is to make and use electricity for lighting purposes, and to exercise the privilege of occupying the public streets with poles and wires, under the laws. Los Angeles will be the principal place of business. Capital stock is $100,000, divided into 1,000 shares; $500 has been actually subscribed. The directors are W. B. Palmer, W. C. Petchner, D. E. Skaggs, James Adams and C. M. Buck.

NEW HAVEN, CT.—Announcement has been made that the United States Illuminating Company, of this city, known at the time of its incorporation last Spring as the New Haven Illuminating Company, will take over soon the properties of the New Haven Electric Light Company, the Bridgeport Electric Light Company, the Bridgeport Illuminating Company, the Stratford Gas and Electric Company, the West Haven Power Company, and others. The deal embraces a proposition to consolidate companies whose combined capital stock is over $1,500,000.

New Electric Railways.

WARREN, OHIO—G. B. Stern and J. D. Elkington, representing Philadelphia capitalists, have completed a tour over the route of the proposed electric railways between Warren and Ashtabula, Burton and Meadville, Pa. They will report favorably to the enterprise.

BLOOMSBURG, PA.—For some time past Columbia County capitalists have been agitating the building of a trolley line between Berwick and Bloomsburg, and to cooperate with Montour County moneyed men to extend the road to Danville and thence on to Sunbury. The right of way has been secured, and the project now looks favorable.

PHILADELPHIA, PA.—The Hudson Valley Electric Company, of this place, has been incorporated to operate railroads and electric plants; capital, $400,000; incorporators, H. D. Long, E. A. Lyon, C. E. Lent, G. S. Wertsner, A. A. Sparks, all of Philadelphia, Pa.

POTTSVILLE, PA.—A new trolley line is to be constructed from Pottsville to Tamaqua, a distance of 17½ miles, and thence to Shenandoah. The right of way has been secured in all of the towns and townships along the route excepting Port Carbon and Pottsville. Shenandoah and Philadelphia capitalists are back of it. They have no connection with the Pottsville Union Traction Company, which operates the lines in this town and vicinity.

KANSAS CITY, MO.—The County Court was asked recently for a franchise to Albert E. Holmes, A. H. Green, J. D. Strother, F. P. Swan and A. N. Gossett for an electric railway along certain roads in the county. The matter was referred to County Counsellor Sebree, who is to make a report as to the power of the court to give a franchise along public roads.

GUTHRIE, O. T.—The Guthrie City Council has granted a franchise to a New York syndicate, represented by Mrs. A. C. Beckwith, of Los Angeles, Cal., to construct and operate an electric railway system here for a period of forty years. The Council required a forfeit of $500 from the company to commence work within a year.

IOWA FALLS, IA.—The Des Moines, Iowa Falls & Northern Railway Company, Iowa Falls, has been formed to construct and operate a railroad; capital, $50,000; incorporators, E. C. Farrington, F. D. Peet, J. H. Carleton, J. M. Rinehart, C. Hutchison, J. D. McKay, W. P. Burke, V. A. Biggs, H. C. Miller, all of Hardin County.

MOUNDSVILLE, W. VA.—The Moundsville, Benwood & Wheeling Railway Company is reported to have sold its electric line between Moundsville and Bendwood to a syndicate, composed of Wheeling gentlemen, who are interested also in the Wheeling Railway Company.

ELKHART, IND. — The Indiana Railway Company, which owns and controls the Interurban electric line connecting South Bend, Mishawka, Elkhart and Goshen, and the city lines at each place, is compelled to double the capacity of the large power plants at midway stations, Osceola and Dunlap, and to build a new plant at South Bend. The work will be done as early in the Spring as possible. The company is also preparing to extend its lines to Laporte and Michigan City.

BOSTON, MASS.—Counsel for the Worcester Consolidated Street Railway Company, appeared before the Railroad Commissioners last week, asking for authority to issue $150,000 additional stock and an equal amount in bonds.

New Telephone and Telegraph Companies.

FALL RIVER, MASS.—The Fall River Automatic Telephone Company has been incorporated; the capital stock is $135,000, and the par value of shares is $50; R. T. Davis is president, and B. D. Davoll is treasurer. The company is to engage in a general telephone business in and outside the state.

PHILADELPHIA, PA.—A charter has been granted in Delaware to the Eastern Telegraph and Telephone Company, of Philadelphia; capital stock, $1,000,000.

ALBANY, N. Y.—The Columbia Long-Distance Telephone Company has been incorporated with a capital of $50,000. It is expected that the line will be extended from Albany to Troy and to Fonda, Little Falls and Utica. There will be connections with intermediate villages, and radiating lines will be connected. Troy will thus be the eastern terminus of the system.

SLATINGTON, PA.—A charter has been granted to the Slate Belt Telephone Company, of Slatington, for the construction and maintenance of telephone lines, etc.; capital, $10,000; incorporators, J. D. Zellner, W. H. Gish, A. J. Kern, all of Slatington; F. Jacobs, F. H. Trexler, of Allentown.

SENNETT, N. Y.—Articles of incorporation has been filed by the Sennett Telephone Company to operate in Sennett and Weedsport, Cayuga County; Elbridge and Jordan, and other towns in Onondaga and Cayuga counties; capital, $500; directors, H. C. Crocker, S. C. Depew and Walter E. Spurr, of Sennett, Cayuga County.

DOVER, DEL.—A charter has been granted to the Interstate Telephone and Telegraph Company to operate telephone lines; capital, $2,000,000; incorporators, J. C. Landes, of Morristown, Pa.; T. Dougherty, of Allentown; A. M. Worstall, of Philadelphia, Pa.

AUTOMOBILE NOTE.

There are now, according to the *Annuaire Generale de l'Automobile*, more than 7,000 owners of automobiles in Europe, the number of such vehicles being, perhaps, 10,000, nearly two-thirds of these being owned in France. Out of this number no less than 4,541 are in the departments. There are more than 600 manufacturers in France, not including the makers of parts, about 1,000 dealers in them, and 100 repair shops. The same authority gives the number of owners of automobiles in Germany as 268; 90 in Austria-Hungary, the same in Belgium, 44 in Spain, 304 in Great Britain, 111 in Italy, 68 in Holland, 114 in Switzerland.

Kindred.... ...Interests

The Electric Appliance Company, Chicago, report that if the Packard lamps contracted for on a single contract last month were placed in a line, tip to base, they would extend six and one-eighth miles.

Messrs. May & Cornwell, Syracuse, N. Y., are manufacturing a line of simple and durable incandescent light street hoods. These hoods are finished in white enamel on the under side and black above, and are made in two styles adapted for high or low tension lighting.

The Bossert Electric Company, of Utica, N. Y., of which Mr. R. B. Corey is the New York agent, has issued its catalogue N, describing panel boards and steel panel board boxes. The company is now engaged upon a large amount of switchboard and interior construction work.

The Bibber-White Company, Boston, is confident that its affairs, which have been somewhat involved, will soon be straightened out. The difficulties arose from furnishing large quantities of railway material for which it is not possible yet to get the pay, thus locking up the capital of the concern.

The Emerson Electric Manufacturing Company, St. Louis, Mo., describes, in its Bulletin No. 3005, new types of standard knife switches, both for switchboard use and of the usual pattern mounted on slate bases. The design of these switches combines with great simplicity an unusual degree of mechanical strength.

The Standard Silver Plating Company, Akron, Ohio, has purchased the good-will, machinery, tools, etc., of the Garl Electric Comdany, of Akron, as well as the exclusive right to manufacture all electrical appliances covered by patents issued to Mr. Garl. This department will be managed by Mr. Garl under the name of the Garl Electric Company.

The L. E. Knott Apparatus Company, of Boston, Mass., has brought out a little catalogue of small and inexpensive telephone apparatus adapted for domestic and private use. The company is also well-known as the manufacturer of a large number of small electrical apparatus, especially of the kind adapted for school and experimental use.

The Eureka Electric Company, Chicago, Ill., manufacturers of telephones and telephone appliances, has brought out a broadside circular illustrating and describing a number of its more recent telephone apparatus. Among these are not only complete telephone sets, switchboards and parts of telephones, but also linemen's testing sets, lightning arresters, repeating coils, etc.

Williamson & Company, of Cleveland, Ohio, has placed a contract with the Western Electric Company for three 100-kilowatt, 125-volt, direct-connected generators to be installed in the Williamson building. These will be direct connected to Ball engines, and will be installed by the construction department of the Western Electric Company. The Sargent Company, of South Chicago, have ordered one 150-kilowatt, 125-volt, belted generator.

"THE LEADING PAPER."

A communication from a firm in Antwerp was received in the New York post office recently, addressed as follows:

ELECTRICAL REVIEW,
Leading Paper,
NEW YORK OF CHICAGO, U. S A.

It is scarcely necessary to say that it was promptly delivered to the "leading paper," and contained a request for sample copy for the reason that, so stated the writer, "We take a great share in the electricity, and no doubt all the American leading firms are presented there."

Our esteemed friends in Antwerp are evidently gentlemen of discernment, and were promptly supplied with a copy of the ELECTRICAL REVIEW where they will find what they were seeking.

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Electrical... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DECEMBER 5, 1899.

638,230 Binding post and connection for electrical apparatus; A. Fischer, New York, N. Y.

638,232 Electric apparatus; C. L. Fortier, Milwaukee, Wis.—An exerciser, comprising two or more electrodes, one or more of which is movable and retracting resistance for each exercising electrode, and a source of electricity generated independently of the exerciser, and a switch for closing or opening the circuit through one or more of said electrodes.

638,236 Electric heater; Edward E Gold, New York, N. Y.—Comprises an open helix of resilient resistant wire, combined with a supporting rod within it of materially smaller diameter, so as to touch it tangentially only, and heads at opposite ends of said rod between which the helix is confined, the helix being under strees between said heads to cause it to press elastically into eccentric contact with the rod.

638,249 Electrical exchange; E. E. Keith, Chicago, Ill.—A series of contact-points arranged in groups, a switch provided with an arm for each group, a series of contact points mounted independently of the switch, but in electrical communication with the different arms, and a selector or auxiliary switch-arm rotatably and longitudinally movable, mounted upon the first mentioned switch, and means for establishing electrical communication with either of said groups through said selector.

638,278 Electrode and process of making same; I. L. Roberts, New York, N. Y.—An electrode composed of a compressed mixture of pulverized glass and carbon, the particles of glass being adherent to each other and acting as a binder.

638,281 Automatic electric elevator; H. Rowntree, Chicago, Ill.—A hoisting motor, a controller therefor, and mechanical connections arranged to be actuated from any landing for operating said controlling mechanism, whereby said motor may be started automatically from any landing and arrested when the car reaches that landing, said connections including means for indicating the location of the car.

638,282 Automatic electric elevator; H. Rowntree, Chicago, Ill.

638,333 Electric indicator for rolling machine; A. P. Hine, Torrington, Ct.—A system for indicating the operation of a rolling machine, consisting of a source of electrical energy, main conductors, a make and break device in one of the main conductors adapted to be continuously operated, a rolling machine and an electrical counter arranged in series across the said conductors, but having the circuit in which they are included normally open, and a device adapted to close the said circuit when the said machine is in operation.

638,388 Electric heater; Edwin E. Gold, New York, N. Y.—Comprises a coil of resilient resistant wire combined with a supporting rod extended within said coil, said coil and rod relatively conformed to make contact only at intervals longitudinally of the coil, the convolutions of the latter between the contact-points being extended through the air out of contact with the rod.

638,390 Storage battery; W. F. Hanscom, San Francisco, Cal.

638,408 Electrically controlled lock, collecting or other box; Fred Williams, Revere, Mass.

638,418 Appliance for telephone switchboards; J. L. McQuarre, Chicago, Ill.—A base having a vertical perforation and a countersunk upper portion constituting the plug-socket, a tube longitudinally movable in the perforation, switch contacts actuated by the tube in its longitudinal movement, the tube having flattened longitudinal faces formed on it to permit the escape of dust from the socket.

638,419 Inking device for telegraph registers; L. E. Oehring, Chicago, Ill.

638,422 Current supply circuit for telephones; C. E. Scribner, Chicago, Ill.—A telephone line, a charging battery in the main circuit, several local storage batteries at different substations included serially in the line-circuit, a telephone at each station in a bridge between the conductors of the line circuit, a return circuit for the charging current connected with the line beyond the last station, and an impedance coil in the return circuit.

638,423 Signal lamp and socket; C. E. Scribner, Chicago, Ill.

638,424 Thermal protector; C. E. Scribner, Chicago, Ill.

638,425 Signal for telephone switchboards; C. E. Scribner, Chicago, Ill.

638,426 Supervisory signal for telephone switchboards; C. E. Scribner, Chicago, Ill.

638,430 Electric arc lamp; E. P. Warner, Chicago, Ill.

638,471 Telephone switch; S. E Rawson, Elyria, Ohio.—A signal-shutter, a plug-switch provided with projecting arms, and means for rotating said plug-switch to cause its arms to engage the shutter and close it.

638,472 Secondary battery or accumulator; C. J. Reed, Philadelphia, Pa.—The method of preventing deleterious effects in a secondary battery in which active material is deposited upon one electrode or set of electrodes from the battery solution during the charging operation, which consists in subjecting detached particles of active material to localized electrolytic action whereby they are redissolved into the battery solution.

638,478 Signalling apparatus; J. G. Shreuder, Edgewater Park, N. J.—Consists of a signal, a motor for shifting the signal, two independent connections from the signal to the motor and a track circuit, controlling the motor and the connections from the motor to the signal.

638,479 Electric advertising device; J. Scott, Toledo, Ohio.

638,480 Toll-collecting appliance for telephone stations; C. E. Scribner, Chicago, Ill.

638,482 Electric generator or motor; N. W. Storer, Edgewood Park, Pa.—An armature having a core provided with slots and a plurality of coils located in said slots, with a commutator to the bars of which armature leads are connected in multiple, the conductors in each slot which are connected in multiple being located side by side.

638,511 Electric-lighting apparatus for vehicles; G. Heidel, St. Louis, Mo.

638,512 Electric arc lamp; G. Heidel, St. Louis, Mo.

638,621 Telephone switchboard; Seymour Morrison and T. L. Springer, McCordsville, Ind.—In a self-contained operator's cam and clearing-out drop for telephone switchboards, a cam-stem, answering-plug lines and ringing-plug lines, an operator's circuit, and a generator-circuit terminating on said stem, a framework on said stem, an electro-magnet in said framework, a switch for electrically connecting the plug lines, the electromagnet and said operator's circuit, and for electrically connecting either of said plug lines with the generator-circuit, an armature for said magnet, a detent on said armature, an annunciator and means for automatically, mechanically restoring said annunciator by the movement of said switch.

638,522 Electric-motor controlling system; F. B. Rae, Chicago, Ill.—A motor and a commutating-switch, two sources of electricity, an armature coil and a plurality of separate field-magnet coils on said motor, separate connections from said field-magnet coils, from said armature-coil and from said sources of electricity to said commutating-switch.

638,545 Electric arc light; E. H. Belden Jackson, Mich.—A frame consisting of a tubular guide for the upper carbon, and a tubular guide for the lower carbon, said guides being in vertical alignment, with platforms secured to said guides and adapted to support the operative mechanism of the lamp, and a tube interposed between the upper carbon and the tubular guide.

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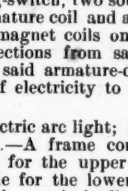

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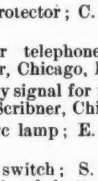

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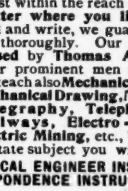

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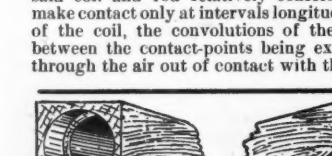

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